

MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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No. 1

INTRODUCTION.

The MONTHLY WEATHER REVIEW for January, 1898, is based on 2,916 reports from stations occupied by regular and voluntary observers, classified as follows: 147 from Weather Bureau stations; numerous special river stations; 32 from post surgeons, received through the Surgeon General, United States Army; 2,567 from voluntary observers; 96 received through the Southern Pacific Railway Company; 23 from Life-Saving stations, received through the Superintendent United States Life-Saving Service; 31 from Canadian stations; 20 from Mexican stations; 7 from Jamaica, W. I. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Government Survey, Honolulu; Dr. Mariano Bárcena, Director of the Central Meteorological Observatory of Mexico; Mr. Maxwell Hall, Government Meteorologist,

Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; and Commander J. E. Craig, Hydrographer, United States Navy.

The REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to generally conform to the modern international system of standard meridians, one hour apart, beginning with Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are generally corrected to agree with the eastern standard; otherwise, the local meridian is mentioned.

STORM WARNINGS AND WEATHER FORECASTS.

By Lieut. Col. H. H. C. DEXWOODY, Supervising Forecast Official.

Under this head it is proposed to make note of all extreme and injurious weather conditions occurring during the month, and the warnings of the same issued by the Bureau, with instances, as far as reported by observers or the press, in which these warnings were of special public benefit. The signals displayed by the Weather Bureau will be referred to as "information," "storm," "hurricane," "cold wave," and "norther," respectively.

The injurious weather conditions of most marked note that occurred during the month, were the frosts and freezing weather in Florida on the 2d, 3d, and 4th, and in the citrus regions of southern California from the 10th to 13th and 20th to 27th, inclusive, the storms of the 21st to 23d and 24th to 26th, that moved from Texas northeast to the New England Coast, and the severe storm of January 31 to February 1, on the New England Coast. In this connection mention is also made of the moderate flood that occurred in the Ohio and central Mississippi valleys during the latter part of January and the early part of February.

THE FLORIDA FREEZE OF JANUARY 2-4, 1898.

Severe cold weather prevailed in Florida on the 2d, 3d, and 4th, freezing temperature on the 2d and 3d, and heavy frosts on the 4th, extending as far south as the latitude of Jupiter. Following are the minimum temperatures which were reported

from Jacksonville, Tampa, and Jupiter, respectively, viz January 2, 24°, 28°, 30°; January 3, 26°, 26°, 30°; January 4, 38°, 38°, 34°.

These conditions were very destructive to early vegetables throughout this region, killing nearly all those of the more tender kinds, except such as were protected. Considerable injury was done to citrus trees, many of the young trees and later shoots being destroyed. The pineapple interests also suffered some damage, although few, if any, plants were entirely killed.

Warnings of these injurious conditions were sent from the Central Office as follows: On the morning of January 1 telegrams to Jacksonville, Tampa, and Jupiter, reading: "For eastern Florida colder with freezing temperature in northern portions and frosts in southern portions Sunday morning." On the morning of January 2, telegrams to the same stations reading: "Freezing temperature and frosts in central and north portions, and severe frosts in south portion of Florida, Monday morning." Although both of the days on which these messages were sent were holidays, making effective dissemination difficult, the warnings were, through the efforts of the Weather Bureau observers, by means of the mail, telegraph, and telephone services, and the cooperation of the railroad officials, very widely distributed throughout the threatened districts, and enabled the people to take effective measures for the protection of their crops.

In this connection the following extracts from the reports of the Weather Bureau observers and newspaper publications are given:

From J. W. Cronk, Observer at Jupiter, January 11, 1898:

Never has a warning been more timely. The weather had been mild all along in this section, no sign of a frost, and vegetables and pineapples were simply luxuriant in their growth. Without the Weather Bureau's warning on January 1 planters would have been taken wholly by surprise. Planters began at once to protect their property.

From J. E. Lanouette, Observer at Tampa, Fla., January 11, 1898:

All local interests here promptly heeded the warning. To cite one instance, when the messenger reached the Tampa Bay Hotel with copies of the message, he found the head florist with a force of men busy at work covering up the tropical plants and flowers. He had already seen the cold-wave signal, and lost no time in taking the necessary precautions.

From letters received by A. J. Mitchell, Section Director, Jacksonville, Fla.:

The information from your office resulted in my saving more than \$500, and 25,000 to 30,000 plants. I gathered about 100 baskets of lettuce, which were sold at about \$2.25 per basket.

Advantage was taken of the warning by truckers and fruit growers to the extent that no serious damage was done by the cold on the 1st and 2d. The citrus trees are comparatively unhurt. Young trees were either banked or wrapped.

The warning was received in ample time, and in many instances around this section truck and oranges were saved. It is difficult to say, in so many dollars and cents, what the saving amounted to, but it is a fact that where people were provident and diligent enough to act on the warning, they were enabled to house fruit and protect vegetables. Potatoes and young orange wood were saved by being covered with dirt.

Everything saved was due to the forecast of frost. The saving in lettuce here was 500 baskets worth \$1.50 per basket. Amount saved, \$750.

We received the warnings about 11:30 a. m. and the cold-wave flag was hoisted at once. Those who were not celebrating New Year banked the trees, and thus saved them.

The following suggested plan for the protection of orange groves from frosts, published in a Florida paper is of interest in this connection:

Titusville, Fla., Indian River Advocate, January 28, 1898.—For a 5-acre grove. Erect a 20-foot fence on the northwest end of grove; another 20-foot fence on southeast side of grove, with a running board directly through the center, so that upon the notification of a cold wave coming from the Weather Bureau, you can run canvas from the northwest and southeast corners to the center running board and fasten it. Have side flaps for your grove which you can drop and fasten to your baseboard running all round.

Then set your resin pots burning inside, enough to make a black smudge, and, in the judgment of the writer, no freeze that you have ever had in Florida would hurt your orange trees.

This plan would also apply to pineapple plantations and vegetable gardens along the east coast or in any other section in Florida, only you would not have to build your fences so high.

To demonstrate the actual saving, if any one in Florida chooses to adopt this plan, we will say that a 5-acre orange grove costs the owner in ten years \$5,000. His income from that grove should be \$2,000 per annum, making in the ten years \$20,000. Original cost \$5,000, making a total of \$25,000. This is the amount he would lose if his grove is frozen, as it would take nearly ten years to bring it back to its original state of bearing.

In the opinion of the writer, the above covering and fences can be built and made to cover a 5-acre orange grove for at least \$2,000, thereby making a net saving to the orange grower of \$23,000.

FROSTS AND FREEZING WEATHER IN THE CITRUS REGIONS OF SOUTHERN CALIFORNIA.

In regard to these conditions Mr. W. H. Hammon, Forecast Official in charge of the San Francisco forecast district, composing California, Nevada, Utah, and Arizona, reports as follows:

Injury from frost occurred in various portions of the citrus region of southern California on the following dates, as determined from reports of regular and voluntary observers and newspaper articles, viz: January 10, 11, 12, 13, 20, 21, 23, 24, 25, 26, and 27. In no instance was there injury in all sections of the citrus region, but there are few sections in

which no injury whatever occurred on some one of these dates, and in some instances the critical temperature was reached on as many as five different dates in January. The most generally severe condition occurred on the morning of January 27. In every instance satisfactory warnings were issued by this office.

On January 10 the warning to the various places in the citrus region of southern California read: "Killing frosts to-night, possibly injurious to citrus fruit." This message was received on January 11. On January 12 it read: "Cooler to-night with killing frost, injurious to citrus fruit where clear and still." On the 13th the message read: "Killing frosts to-night, some danger to citrus fruit." On January 20 a warning was issued to this same region of, "frost to-night, possibly injurious to citrus fruit." On the 21st the warning read: "Killing frost to-night, some danger to citrus fruit." On the 23d this warning was repeated. On the 24th the warning read: "Killing frost to-night, probably injurious to citrus fruit." On the 25th the message read: "Probably frost to-night, injurious to citrus fruit where clear." The warning of the 26th read: "Killing frost to-night, generally injurious to citrus fruit."

Below is given a table of minimum temperatures at various points in southern California during December, 1895, December, 1897, and January, 1898, which have been taken from the records of the regular and voluntary observers in that region:

Stations.	December, 1895.	December, 1897.	January, 1898.	Stations.	December, 1895.	December, 1897.	January, 1898.
Anaheim.....	37	35	26	Redlands.....	32	27	27
Colton.....	29	27	26	Riverside (A. H.)..	29	27	30
Crafton.....	28	24	28	San Bernardino....	25	27	24
Escondido.....	22	18	21	San Diego.....	34	36	36
Fallbrook.....	32	30	29	Santa Barbara....	38	32	34
Los Angeles.....	34	30	31	Santa Paula.....	32	30	24
Ontario.....	32	28	29	Ventura.....	36	26	25
Pomona.....	32	25	26				

From these temperatures it will be observed that, on the whole, slightly lower temperatures were recorded this year than in the freezes of the other months mentioned.

The statement is generally made in newspapers that in many places lower temperatures were recorded in January, 1898, than in many years previous, and the amount of injury to citrus fruit during the January freeze is generally estimated at from 10 to 20 per cent. The value of the orange crop alone is estimated at from \$6,000,000 to \$7,000,000. A comparison of the minimum temperatures during this season (December, 1897, and January, 1898) with those of 1895, shows that in almost every instance lower temperatures occurred this season than in 1895, while the injury to the citrus crops will not exceed one-half that of 1895. The only reasonable explanation of the diminished injury will seem to be the greater efforts to protect the crop this season than heretofore, in accordance with the warnings received from this office, and suggestions previously made, relative to efficient means of protection. It would seem, from a comparison of these temperatures, that the saving resulting from these means must, to the various citrus crops, amount to several millions of dollars.

FROSTS IN TEXAS.

Frosts and freezing weather occurred in the truck-growing regions of Texas in vicinity of Galveston on January 2, 16, and 27, warnings of which were, in each instance, sent out by the Local Forecast Official at Galveston, on the preceding day, and enabled growers to effectively protect their crops.

STORMS OF 21-23 AND 24-26.

These two storms which were of marked severity developed, the first in southwestern Texas and the second in Arizona, and following nearly the same path moved northeastward across the central valleys and lower Lake Region and off the New England Coast. They were accompanied by heavy precipitation which, falling as snow in the northern portions of the regions traversed and being attended by high winds, caused considerable damage to various interests and interruption to traffic, particularly in northern Illinois, Wisconsin, and Lower Michigan.

The following maximum wind velocities, in miles per hour, were reported during the twelve hours ending with the hours named: 22d, 8 p. m., Chicago, 68; Cairo, 56. 23d, a. m., Chicago, 60; Cleveland, 52; Erie, 48; 23d, 8 p. m., Cleveland, 72; Buffalo, 76; New York and Eastport, 60. 25th, 8 p. m., St. Louis, 68; Cairo, 56; Indianapolis, 52; Chicago, 64;

Memphis, 52. 26th, 8 a. m., Chicago and Cleveland, 46; Cincinnati, 42.

The storm of the 21st-23d was notable for the unusually high tides which it caused on the Massachusetts Coast, and from which considerable damage resulted to seaport cities and towns in that region.

Prof. E. B. Garriott, in charge of the Chicago forecast district, reports as follows in regard to the warnings issued for these storms from the Weather Bureau Office in Chicago:

The first important storm appeared over the lower Mississippi Valley the morning of the 22d. Calculating that the storm center would move northeastward with increasing energy, the following warning was telegraphed all open lake ports at 9:30 a. m.: "Heavy snow and increasing and high northeast winds indicated for next twenty-four hours," and warning of heavy snow was sent to Lower Michigan, south and east Wisconsin, Iowa, eastern Missouri, northern Illinois, and northern Indiana. At 1:15 p. m. lake ports were again telegraphed as follows: "Present conditions indicate dangerous northeast gale and heavy snow during next twenty-four hours."

Three days later another storm of the same type and following almost the same path appeared. On the morning of Monday, the 24th, a "norther" was forecast for Iowa, south and east South Dakota, Nebraska, Kansas, and Colorado; cold-wave signals were ordered for western Iowa, south and east South Dakota, Nebraska, and Kansas; and lake ports were notified that "Heavy snow with increasing easterly winds was indicated by Tuesday morning." Heavy snow was forecast for southern Minnesota, and for Tuesday in Lower Michigan and Wisconsin. At 1:40 p. m. warning of heavy snow was sent to western Missouri. At 9 a. m. of the 25th, when the storm center had advanced to the middle Mississippi Valley, lake ports were wired that "Heavy snow and dangerous northeast gales, shifting to-night to north, may be expected; cold-wave warnings were extended eastward over the balance of the Chicago district, except Upper Michigan; warnings of heavy snow were repeated to Lower Michigan and south and east Wisconsin, and were carried over northern Illinois and northern Indiana.

The areas covered by heavy snow were remarkably well defined in the forecasts and warnings, and cold-wave warnings were verified over practically all the territory to which they were sent, although in localities the verifications were scarcely technical. The northeast gales which attended the storm were particularly severe. Great benefit was undoubtedly derived from the very ample and accurate warnings. No marine disasters on the Lakes resulted from the storms. The night of the 26th the steamer *City of Duluth* ran aground on a bar at the entrance to the St. Joseph, Mich., harbor, and the high sea left from the storm of the 25th and the accumulated ice contributed to the final loss of the vessel and cargo.

The time has arrived when the vast shipping and produce interests and the transportation companies recognize the great commercial value of the forecasts, and on the Lakes travelers and shippers mistrust the shipmaster who assumes to ignore the storm warnings of the Weather Bureau.

Storm signals for southeast to south gales on the New England and New Jersey coasts were ordered from the Central Office at 10:15 p. m. of January 22, and cold-wave signals throughout western Pennsylvania, western New York, and Ohio on the morning of the 23d.

At 2 p. m. of the 25th, southeast storm signals from Eastport to Baltimore and southwest storm signals from Fort Monroe to Wilmington were ordered with a warning of southeast to south gales with snow or rain. These warnings were thoroughly distributed and of undoubted value. Concerning the storm of the 21st-23d, a dispatch from Chicago of January 23, published in the Washington Times of January 24, states that:

On the lake no steamers could long have escaped unscathed, but as far as known every vessel, through the early warning of the Weather Bureau, was able to run into a safe harbor.

SEVERE SNOW AND WIND STORM OF JANUARY 31-FEBRUARY 1.

The severe snow and wind storm that passed over eastern New York and New England on January 31 and February 1, 1898, was of unusual violence and destructiveness. As the morning map of February 1 was incomplete on account of the nonreceipt of reports from some of the stations near the center of the storm, it was thought desirable that a series of charts, showing the weather conditions and the location of the storm at the time of the two regular observations of January

31 and February 1, be published in this REVIEW. (See Charts Nos. X, XI, XII, XIII.) This storm may be said to have been the outcome of two disturbances that appeared on January 29, on the eastern Rocky Mountain Slope at the northern and southern extremities, respectively, of a trough of low pressure extending from Manitoba to Texas. These disturbances with the connecting trough moved slowly eastward with but slight increase in energy, and on the morning of Monday, January 31, were central, one over Lake Huron with a barometer reading of 29.50, and the other off the North Carolina Coast. (See Chart No. X.) The conditions at this report have a close resemblance to those preceding the memorable blizzard of March 12 and 13, 1888. The probable junction of these depressions and the dangerous nature of the resultant storm were then evident, and at 9:45 a. m. on the 31st, storm southeast signals were hoisted from Hatteras to Eastport with warning of "southeast gales and heavy snow," and instructions issued to observers in the threatened regions to warn shipping and railroad interests. Cold-wave warnings were issued on the evening of the 31st for New England, eastern Pennsylvania, New York, New Jersey, Virginia, District of Columbia, and eastern North Carolina. At 8 p. m. of the 31st the storm formed from the union of these two disturbances was central on the southern New England Coast, with greatly increased energy, the barometer at Block Island reading 29.26 with a northeast wind of 52 miles. (See Chart No. XI.) The storm increased greatly in intensity during the night and moved northeastward to the Maine Coast, the center passing between Block Island and Nantucket and between Nantucket and Boston. (See Chart No. XII.) The lowest pressure at Nantucket, 28.63, occurred about 3 a. m., February 1, and at Boston, 28.78, about 3:30 a. m. of the same date. Maximum velocities of 60 miles northeast at Block Island, 71 southeast at Nantucket, 50 northeast at Boston, and 38 north at Portland, occurred during the night, and the high winds, in connection with the heavy snow that fell, caused great destruction to shipping on the New England Coast, and great damage to railroads, telegraph, and telephone lines throughout eastern New York and New England. The warnings issued on the morning of the 31st were given the widest possible distribution throughout the threatened regions, and as shown by the reports received were of great benefit.

The following extracts from reports of Weather Bureau officials, descriptive of the storm, and from newspapers in relation to the warnings are given.

From Wm. Davis, Observer, Block Island, R. I.:

The storm reached a verifying velocity at 8:20 a. m., January 31, and continued to increase gradually, reaching 60 miles per hour at 10:30 p. m., and after midnight the wind began to diminish slowly, but continued above the verifying velocity till 6 a. m., February 2. Light snow fell from 2 a. m. to 8:40 a. m., on January 31, when the snow turned to rain. Heavy rain fell during the afternoon and evening, and during the night rain turned to snow again, ending at 3:30 p. m., total amount, including melted snow, 2.25 inches.

Southeast signals were received at 10:40 a. m., January 31, and at 7 a. m., February 1, they were changed to northwest by the observer, as telegraphic communication was cut off. The warning was thoroughly and promptly distributed among the fishermen and those interested in other pursuits, the former recognizing the warnings to be of the greatest benefit, especially since November 9, when six fishing smacks dragged anchor and went ashore in Great Salt Pond, during a northwest storm, warnings of which were displayed well in advance to all parties interested.

Although the storm of January 31 and February 1 was quite severe, there were no disasters in this vicinity, and as far as can be learned, there was no damage done on the island, which is due to the fact that the people are placing confidence in the warnings.

From W. W. Neifert, Observer, Nantucket, Mass.:

The order to "Hoist southeast signals" was received here at 10:36 a. m., January 31, and the information was immediately telephoned to Great Point, and generally distributed about the town, as is usual in such cases, and the signals displayed. * * * The storm was the most severe on record here.

From John W. Smith, Local Forecast Official, Boston, Mass.:

The temperature ranged at or below freezing throughout the storm. The precipitation was wholly in the form of moist snow, the total depth of which was 14.3 inches; melted, 1.38 inch. Snow began falling at 8:15 a. m., January 31, and ended 2:40 p. m., February 1.

The storm warnings, order to hoist southeast storm signals, and warnings of heavy snow were received at 10:21 a. m., January 31. The warnings were at once bulletined, and were telephoned to all transportation companies, to newspapers, and furnished to the press and news associations. The dissemination was most thorough and the warnings timely. Much interest was manifested, especially by the transportation companies. The railroad and street car companies acted promptly in distributing wrecking forces, snow plows, etc. No vessels left the harbor during the storm.

The storm was tremendously destructive in this vicinity to property and to life. Not since March 12, 1888, some say January 17, 1867, has such a blizzard reached New England. The heavy snow blockaded the street cars and greatly delayed steam railroad travel, and in a few instances trains were temporarily blockaded. There was a general wrecking of overhead wires, and hundreds of poles, iron and wood, were blown down or fell from greatly increased strain from the clinging snow and falling wires. Although the danger from crossed and live wires was very great, no person was killed, although about 30 horses were electrocuted in various parts of the city. Only for the mild weather that prevailed during the storm considerable loss of human life must have resulted among the many who were caught out in the storm. The storm also served to close up the school system, close many of the large stores, and threaten a milk famine. On the New England Coast it brought death to more than a score of mariners, destruction to 10 vessels, and damage to as many more. The bodies of 7 sailors were recovered at Nahant, Mass., 4 at Gloucester, Mass., 3 at Rockport, Mass., and 12 at Bakers Island, Mass.

Conservative and reliable estimates place the loss by the storm to electric and steam railroads, telegraph and telephone companies in the city of Boston and neighboring cities and towns, to corporations and individuals generally at about \$1,500,000. The damage to shipping is estimated at from \$150,000 to \$200,000.

New York Commercial American, February 3, 1898.—Notwithstanding the Weather Bureau gave prompt warning of the approach of a storm, thus enabling masters of vessels in port to avoid danger, incoming vessels had no such warnings, and many of them met with more or less serious disaster.

Albany Journal, February 1, 1898.—Had it not been for the timely warnings sent out by the Chief of the Weather Bureau at Washington yesterday to the railroads of this section, things would be in a much worse state. As it is, things are bad enough, but the storm found the roads ready with the great plows and gangs of men.

Times-Union, Albany, N. Y., February 1, 1898.—The heavy snow warning sent out by the Weather Bureau was of the greatest value to steam and surface railroads, also the shipping merchants in this section of the State. All interests received timely warning and made extensive preparations to keep the lines of travel open.

The following newspaper extract relating to the general subject of maritime warnings issued by the Weather Bureau is given as of interest in this connection:

New York Journal, January 9, 1898.—While it was said that the Weather Bureau predictions are not always absolutely relied upon, and that in the matter of forecasts the service is still not an exact science, it was shown that thousands of vessels and millions of dollars worth of valuable property are saved annually through the timely warnings of this Bureau, and to say nothing of the preservation of human life.

The mail steamers do not, of course, let any adverse forecasts prevent their sailing. Their owners can not afford to. These vessels are scheduled to leave port at a certain hour, and when that hour arrives the mail contracts, express business, and, indeed, the passengers themselves demand that the steamer shall proceed at the time agreed upon.

Despite hurricane signals the transatlantic liners steam to sea, but their captains bear the signals in mind just the same. They know when a hurricane is likely to sweep over their vessels, and they prepare for it.

Superintendent Houghton, of the Maritime Exchange, said:

The forecasts have not reached an absolutely scientific basis yet, but forecasts of the Weather Bureau are valuable, and many vessels are undoubtedly saved from wreckage by heeding them. Some idea of the vast floating interests on the Atlantic Coast may be had when I tell you that 5,628 transatlantic steamers, with an aggregate tonnage of 10,076,148, and 5,842 sail craft, aggregating 2,105,688 tons, enter and leave ports on the Atlantic seaboard during a single year. The value of the cargoes is now more than a billion and a half dollars.

Our coastwise traffic is tremendous. In one year more than 17,000 sailing vessels and 4,000 steamers enter and leave the ports between

Maine and Florida. Their cargoes are estimated at \$7,000,000 in round numbers; so you see the value of the property the Weather Bureau aims to protect by warnings of approaching storms.

The pilots generally praised the weather forecasts as their greatest aids. "We watch them every time," said one, "and you may depend that a large number of the navigators do also. I remember well of taking out a Ward liner, and just before we left the dock the captain saw hurricane signals on the Weather Bureau. As a result the steamer anchored in Gravesend Bay, and there was a small fleet anchored near us for just the same reason. The forecasts are invaluable to navigators."

FLOOD IN THE OHIO AND CENTRAL MISSISSIPPI VALLEYS.

Between January 8 and 26 six storms developed in the southwestern portion of the United States, or in northern Mexico, and following closely the same path, moved north-eastwardly across the central Mississippi and Ohio valleys. These storms were attended by excessive precipitation in the valleys named, the total amount for the month being from 6 to 10 inches, or from 2 to 5 inches in excess of the normal, which resulted in a moderate flood during the latter part of January and forepart of February in the Ohio and in the Mississippi below Cairo. The river was above the danger line at Cincinnati from January 20 to 29, inclusive; at Louisville from January 21 to 30, inclusive; at Cairo from January 24 to February 6, inclusive; at Memphis from January 30 to February 8, inclusive; and at Vicksburg from February 4 to 17, inclusive.

Warnings of this high water were issued by the Weather Bureau officials in charge of the river forecast districts in their region well in advance of its occurrence, and were of considerable benefit, as shown by the following extracts from reports from officials in charge of river centers, viz:

From letters received from P. H. Smyth, Observer, Cairo, Ill.:

MOUNT VERNON, IND., February 15, 1898.

The information furnished by the Weather Bureau was the means of a great many farmers saving stock and all farming implements by removing them to high ground.

SHAWNEETOWN, ILL., February 11, 1898.

The loss in our bottoms was almost confined to the loss of corn, which is something over 10,000 bushels. A few hogs were lost, but no cattle or horses.

The reports are of great value to our people, and they were especially so, as the flood was unexpected in January. The reports gave our farmers warning in time to get their stock removed, and to obtain facilities for getting rid of their corn. Our people depend upon these reports and act on the information they give them. We notified Blackburn, Ky., and Saline Mines, Ill.

At the time the warning was received there were in the bottoms, between the mouth of Wabash and Saline rivers in Illinois and Kentucky, cattle, horses, and hogs, valued at between \$55,000 and \$60,000.

From S. C. Emery, Local Forecast Official, Memphis, Tenn.:

The most marked benefit resulting from the flood warnings were in connection with levee work along the St. Francis and Yazoo basins. By being advised that a 40 or 42 foot stage would be reached at Cairo, and that it would reach at least 33 feet at Memphis, the engineers in charge of this work were enabled to so far repair the crevasses made last year, or build such temporary protection as would sustain the expected flood wave. At Craighead Point and other points in the St. Francis levee system a large force was set to work, while to the south at Flower Lake and Stopps Landing, about 400 teams and as many men were constantly employed, so that by the end of January the levees in this section were in very good condition. This prompt and energetic work on the levees, together with the assurance given out from this station that no disastrous overflow was probable, did much to preserve a feeling of security among the people and prevented much unnecessary moving of property. The reports and warnings were freely distributed through the country by means of the press, river bulletins, and maps, so that most of the inhabitants were fully informed as to the situation, as well as what might be expected.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. HAZEN.

During the month the apparent paths of ten highs and twelve lows were sufficiently defined to be traced on Charts

I and II. The accompanying table exhibits a few facts regarding the apparent place of origin and disappearance of these highs and lows, their duration, length of path, and velocity. The most remarkable feature of these paths during the month is the fact that both high and low areas all passed to the ocean off Newfoundland. Another peculiarity is their very great apparent velocity, reaching 36.6 miles an hour in the case of the lows.

HIGHS.

These conditions in general took their origin to the north of Montana, though the permanent high area in the middle Plateau Region gave rise to several. Owing to the continuance of the rather permanent high pressure in the middle Plateau Region the temperature conditions were rather moderate in the Mississippi Valley and eastward to the Atlantic Coast. As high No. V moved toward the Mississippi Valley it caused a fall in temperature of 32° in twenty-four hours and to 36° at Memphis, 13th, a. m. The next morning there was a fall of 32° in twenty-four hours at Cleveland.

LOWS.

The lows of the month have had a peculiar distribution in that six of them have begun off the south Pacific Coast or in the extreme Southwest; five of them to the north of Montana, and one off the north Pacific Coast. They have all moved to the Gulf of St. Lawrence. As No. VI moved to the north of Arkansas on the night of the 11th a severe tornado occurred at Fort Smith in the southeast quadrant.

The highest wind of the month was 68 miles an hour at Chicago, afternoon of 22d, and while low area No. IX approached the Lake Region.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.										
I.....	3, a. m.	50	87	5, a. m.	46	62	1,370	2.0	685	28.5
II.....	3, a. m.	42	111	6, p. m.	45	50	2,800	3.5	817	34.0
III.....	4, p. m.	43	114	9, a. m.	28	80	2,690	4.5	598	24.9
IV.....	8, p. m.	53	119	12, a. m.	47	59	2,680	3.5	766	31.9
V.....	12, p. m.	45	114	15, p. m.	46	58	3,040	3.0	1,013	42.2
VI.....	12, p. m.	54	116	20, p. m.	47	60	4,400	8.0	550	22.9
VII.....	20, p. m.	34	89	23, a. m.	47	57	1,920	2.5	768	32.0
VIII.....	21, p. m.	40	113	25, p. m.	47	67	3,150	4.0	787	32.8
IX.....	25, a. m.	50	119	28, p. m.	47	74	2,100	3.5	600	25.0
X.....	28, a. m.	54	109	31, p. m.	47	56	2,800	3.5	800	33.3
Total.....							27,010	38.0	7,384	.....
Mean of 10 tracks.....							2,701		738	30.8
Mean of 38 days.....									711	29.6
Low areas.										
I.....	1, p. m.	54	111	4, a. m.	48	54	2,680	2.5	1,072	44.7
II.....	2, a. m.	51	111	6, a. m.	47	54	2,950	4.0	843	35.1
III.....	4, p. m.	53	116	7, p. m.	46	58	2,840	3.0	947	39.5
IV.....	6, a. m.	51	115	9, a. m.	47	59	2,580	3.0	860	35.8
V.....	7, p. m.	37	100	10, p. m.	48	51	2,750	3.0	917	38.2
VI.....	10, p. m.	32	105	13, p. m.	48	55	2,980	3.0	993	41.4
VII.....	12, a. m.	34	120	16, p. m.	46	56	4,030	4.5	895	37.3
VIII.....	17, p. m.	31	103	21, p. m.	45	56	3,160	4.0	790	32.9
IX.....	19, p. m.	32	115	24, p. m.	49	56	3,690	5.0	738	30.8
X.....	23, a. m.	21	114	27, a. m.	47	55	3,570	4.0	892	37.2
XI.....	26, a. m.	53	115	29, p. m.	43	58	2,920	3.5	834	34.8
XII.....	28, p. m.	48	128	2, a. m.*	48	64	3,390	4.5	753	31.4
Total.....							37,540	44.0	10,534	.....
Mean of 12 tracks.....							3,128		878	36.6
Mean of 44.0 days.....									853	35.5

* February.

THE WEATHER OF THE MONTH.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

The statistical aspect of the weather of the month is presented in the tables which form the closing part of this REVIEW. The numerical values of the tables have been generalized in a number of cases, the results appearing on Charts Nos. III to IX, inclusive. Table I in particular contains a variety of details from which the reader may select those most interesting to himself.

PRESSURE AND WIND.

In the United States in January the map of normal isobars shows that a ridge of high pressure extends diagonally across the country from Georgia to Washington. There are two areas in this ridge of high pressure with values over 30.20 inches, viz, one in the west covering Utah, Nevada, and portions of the adjoining States of Oregon, Idaho, Wyoming, and Colorado, and one in the east overlying the mountainous regions of Tennessee, northern Georgia, and parts of the Carolinas. Pressure is lowest over the north Pacific Coast and the Canadian Maritime Provinces, whence it decreases to the permanent areas of low pressure occupying the North Atlantic and Bering Sea, respectively.

The normal prevailing winds on the Atlantic and Gulf coasts are from the northwest and north, from the colder land to the warmer water surface. On the Pacific Coast the winds generally coincide with the direction of the coast line; on the upper half of the coast, say from Eureka northward, southerly winds are most likely to prevail; on the southern half northerly winds are most frequent. The winds of the Plateau and Rocky Mountain regions are somewhat variable, southwesterly winds generally prevailing west of the mountains and northwesterly on the easterly slope and the plains

beyond. The winds of the middle and upper Mississippi Valley are westerly or northwesterly; westerly winds also prevail in the upper Lake Region, while the winds of the lower Lake Region and Ohio Valley are generally southwesterly.

In January, 1898, pressure was higher than usual on the north and middle Pacific Coasts, over the Plateau Region, and the lower portion of the Florida Peninsula. Elsewhere it was lower than the average. The notable feature of the month was the very high pressure over the Plateau Region. The position and magnitude of the area of high pressure in this region determine, in a great measure, the character of the weather on the Pacific Coast, and also in a somewhat less degree east of the Rocky Mountains.

It will be noticed by an inspection of Chart IV that the western area of high pressure extends farther to the westward and northward than usual, thus giving cold northerly and northeasterly winds to California and Arizona. On the northern and northeastern sides of the high the winds were southwesterly or southerly, and the weather of Montana and the Dakotas was relatively warm and pleasant. The pressure distribution of the present month is very similar to that of January, 1891, as may easily be seen by a comparison of Chart II of the REVIEW for that month with Chart IV of the current REVIEW. There is also a marked similarity between the conditions of temperature and rainfall of the two months.

TEMPERATURE OF THE AIR.

The normal temperature of the air in the United States in January varies from about 70° at Key West, 56° at Jacksonville, 54° at New Orleans, Galveston, and San Diego to

20° at Eastport, 18° at Burlington, 24° at Buffalo, 25° at Detroit, 9° at Duluth, 6° below zero at St. Vincent, 8° above at Havre, 24° at Spokane, and 39° at Seattle on Puget Sound. The warmest regions, as may be seen from the above figures, are the South Atlantic, Gulf, and Pacific Coast States; the coldest are the Red River Valley of the North and contiguous territory. The Pacific Coast is somewhat warmer than the Atlantic, and both are considerably warmer than the interior. How much warmer may easily be seen by an examination of the numerical values in Table I.

The month was generally mild and open east of the Rocky Mountains, on the north Pacific Coast, and throughout northern Idaho and Montana. In the Valley of the Red River of the North and throughout portions of North Dakota, the coldest part of the United States, the month averaged about 15° warmer than usual. It was colder than usual throughout California and the Plateau Region eastward to the eastern foothills of the Rocky Mountains and southward to the Mexican boundary line.

East of the Rocky Mountains the month was considerably warmer than usual except in Maine, northern New Hampshire, and Vermont.

The observing stations in the Rocky Mountain and Plateau regions, widely separated as they are, show, nevertheless, the influence of local environment in a number of instances. The effect of Chinook or föhn winds in northern Idaho, northwestern Montana, and elsewhere, may be seen by an examination of the surface isotherms on Chart VI.

In the case of the föhn winds of Montana and Idaho it is to be observed that almost equally high temperatures prevailed on both sides of the mountain range. This fact is shown in the following table:

West of the Range.			East of the Range.		
Stations.	Elevation.	Mean temperature.	Stations.	Elevation.	Mean temperature.
	Feet.	°		Feet.	°
Colfax, Wash.....	2,300	27.3	Augusta, Mont.....	3,500	26.6
Rosalia, Wash.....	2,300	24.8	Dupuyer, Mont.....	.....	28.4
Spokane, Wash.....	1,943	26.0	Fort Benton, Mont.....	2,663	29.6
Cœur d'Alene, Idaho.....	.....	27.4	Greatfalls, Mont.....	3,350	30.7
Fort Sherman, Idaho.....	2,196	26.2	Troy, Mont.....	2,250	24.6
Kootenai, Idaho.....	1,750	24.6			
St. Maries, Idaho.....	.....	28.2			

All of the stations in the first column of the above table are west of the main chain of the Cœur d'Alenes, except Kootenai. The latter is a small station on the Great Northern Railway at the head of Lake Pend O'Reille, where Clarks Fork, of the Columbia, breaks through the Cœur d'Alenes from the southeast. The stations in the fourth column all lie to the eastward of the main chain of the Rocky Mountains, except Troy. The latter, a station on the Great Northern Railway, is situated in the northeastern end of a valley on the Kootenai River, about 40 miles long and from 5 to 8 miles wide. The valley is flanked on either side by mountains ranging from 5,000 to 9,000 feet above sea level. Its general direction is northwesterly and southeasterly. Kootenai is about 80 miles west of Troy on the western side of the Cabinet Range of mountains, while Troy is on the eastern side.

The remaining stations under the heading "east of the range" are situated on the plains at distances varying from 20 to 100 miles from the 5,000-foot contour line which marks the eastern base of the main chain of the Rocky Mountains.

The temperature conditions above noted are not permanent, but depend, partly upon the contour of the land surface, and partly upon the pressure distribution over Oregon, Nevada,

and Utah. There are a few other localities in the Plateau Region where the temperature appears to be higher on the average than would be expected *a priori*. One in particular is found in the Snake River Valley, southwestern Idaho. Present observations are insufficient, however, to delimit the region with accuracy.

A cold wave of rather more than ordinary severity passed over Florida and the South Atlantic States on the 1st, 2d, and 3d. Minimum temperatures of 24° at Jacksonville, 28° at Tampa, and 30° at Jupiter were registered, while heavy frosts occurred as far south as the last-named place. This cold wave brought the lowest temperatures of the month to the region from Missouri, Arkansas, Oklahoma, and Texas eastward to the Atlantic. The cold wave of the 29-30th, which moved from the Great Lakes eastward, brought the lowest temperature of the month throughout the Lake Region and New England.

The distribution of the observed monthly mean temperature of the air over the United States and Canada is shown by red lines (isotherms) on Chart VI. This chart also shows the maximum and the minimum temperatures, the former by broken the latter by dotted lines. As will be noticed, these lines have been drawn over the Rocky Mountain Plateau Region, although the temperatures have not been reduced to sea level; the isotherms relate, therefore, to the average surface of the country in the neighborhood of the various observers, and as such must differ greatly from the sea-level isotherms of Chart IV.

The average temperatures of the respective geographic districts, the departures from the normal of the current month and from the general mean since the first of the year, are presented in the table below for convenience of reference:

Average temperature and departures from the normal.

Districts.	Number of stations.	Average for the current month.	Departure for the—	
			Current month.	Interval since January 1.
		°	°	
New England.....	10	27.0	+ 0.2	.....
Middle Atlantic.....	12	35.6	+ 3.1	.....
South Atlantic.....	10	50.7	+ 4.2	.....
Florida Peninsula.....	3	65.7	+ 1.0	.....
East Gulf.....	7	54.7	+ 4.5	.....
West Gulf.....	7	52.6	+ 6.0	.....
Ohio Valley and Tennessee.....	12	39.6	+ 5.3	.....
Lower Lake.....	8	29.2	+ 3.9	.....
Upper Lake.....	9	23.6	+ 5.6	.....
North Dakota.....	3	17.6	+ 15.1	.....
Upper Mississippi.....	11	28.8	+ 7.7	.....
Missouri Valley.....	10	29.3	+ 9.2	.....
Northern Slope.....	7	22.1	+ 5.0	.....
Middle Slope.....	6	31.7	+ 3.6	.....
Southern Slope.....	2	40.9	+ 4.2	.....
Southern Plateau.....	4	40.9	+ 3.1	.....
Middle Plateau.....	3	21.0	+ 8.0	.....
Northern Plateau.....	4	21.6	+ 1.8	.....
North Pacific.....	9	39.8	+ 0.9	.....
Middle Pacific.....	5	44.3	+ 2.8	.....
South Pacific.....	4	47.9	+ 2.7	.....

In Canada.—Professor Stupart says:

The temperature conditions over the Dominion were, on the whole, decidedly abnormal, as in the Northwest Territories the mean for the month was from 11° to 16° above average, the greatest excess being in Alberta, while in the Province of New Brunswick the mean was from 4° to 7° below average. * * * The change between the unusual mildness of Alberta and the abnormal cold of New Brunswick was gradual from west to east, and the Ottawa and upper St. Lawrence valleys and also Vancouver Island were the only parts of the Dominion where the mean temperature was just equal to the average.

Review of the season.—The present winter has been colder than usual on the Pacific Coast and Plateau Region. Minimum temperatures in the Great Valley of California during December, 1897, were 27° at Redbluff, 28° at Sacramento, and 23° at Fresno. During the present month they were 24° at Redbluff, 26° at Sacramento, and 24° at Fresno. In

southern California minimum temperatures of 36° were recorded at San Diego in both December, 1897, and January, 1898. This is but 4° above the lowest point reached at that station in the last twenty-five years. The lowest temperatures hitherto recorded in the Great Valley are 18° at Red-bluff, 19° at Sacramento, and 20° at Fresno.

East of the Rocky Mountains the winter thus far has been mild and open. No cold waves of unusual severity have passed over the country. Navigation between the American and Canadian sides of the St. Marys River at Sault Ste. Marie remained open until December 30; Lake Erie was also open to navigation in some portions as late as January 15.

The present season resembles very much the mild winter of 1890-91.

PRECIPITATION.

[In inches and hundredths.]

The normals for January show two regions of heavy precipitation, viz, one on the north Pacific Coast, the other in the lower Mississippi Valley. The regions of moderate precipitation are portions of California, the Puget Sound country, and the Willamette Valley west of the Rocky Mountains, the middle Mississippi Valley, the Lake Region and Ohio Valley, the Atlantic seaboard, New England, and Florida in the east. The regions of scant or variable precipitation are the upper Mississippi and Missouri valleys, the plains west of the one hundredth meridian, and the Rocky Mountain and Plateau regions. Under normal conditions, therefore, the greater part of the United States lies within the region of moderately heavy rains or snows, aggregating, say, from 2 to 4 inches during the month.

Averages and departures by districts are summarized for convenience of reference in the following table:

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Since Jan. 1.
		<i>Inches.</i>		<i>Inches.</i>	
New England	10	4.57	115	+0.60	.....
Middle Atlantic	12	2.94	81	-0.70	.....
South Atlantic	10	1.59	37	-2.70	.....
Florida Peninsula	3	0.37	14	-2.30	.....
East Gulf	7	2.67	32	-2.50	.....
West Gulf	7	4.03	114	+0.50	.....
Ohio Valley and Tennessee	12	7.11	169	+2.90	.....
Lower Lake	8	3.88	145	+1.20	.....
Upper Lake	9	2.39	114	+0.30	.....
North Dakota	3	0.12	19	-0.50	.....
Upper Mississippi	11	2.88	162	+1.10	.....
Missouri Valley	10	1.48	137	+0.40	.....
Northern Slope	7	0.88	56	-0.30	.....
Middle Slope	6	1.69	190	+0.80	.....
Southern Slope	2	0.80	100	0.00	.....
Southern Plateau	4	0.82	158	+0.30	.....
Middle Plateau	3	0.58	35	-1.10	.....
Northern Plateau	4	1.48	65	-0.80	.....
North Pacific	9	4.98	62	-3.10	.....
Middle Pacific	5	1.50	27	-4.00	.....
South Pacific	4	1.19	43	-1.60	.....

The geographic distribution of precipitation for the current month is shown on Chart III. Much rain (10 inches on the average) fell in the Ohio and middle Mississippi valleys over a strip of country about 200 miles wide and 700 miles long. The fall on both sides of this area decreased quite rapidly, there being less than 0.50 of an inch on the Georgia coast and over the Florida Peninsula. The fall was moderately heavy in the lower Lake Region, St. Lawrence Valley, Canada, and New England, but light on the Pacific Coast. More rain falls on the north Pacific Coast than is required for agricultural purposes, hence a deficit in that region is of little economic importance. In California, on the other hand, when precipitation falls far short of the normal quantity, the results are likely to be disastrous. The current month, as

well as December, 1897, was one of greatly diminished rainfall on the Pacific Coast, not, however, to the permanent injury of winter grains.

The precipitation of the Rocky Mountain and Plateau regions, so far as can be determined from relatively low-level stations, was a little less than the normal amount.

In Canada.—Prof. R. F. Stupart says:

The precipitation appears to have been rather heavy in most parts of British Columbia, being chiefly in the form of rain on the lower mainland and snow on upper levels. In the Northwest Territories and Manitoba it averaged about 5 inches of snow, or roughly speaking, about half the ordinary January fall. From the north shore of Lake Superior, eastward to the lower St. Lawrence Valley, and including the Parry Sound and Nipissing districts, the snowfall was scarcely equal to the average, but in the more southern parts of Ontario, and generally in the Ottawa and St. Lawrence valleys, the combined rainfall and snowfall was in excess of the average. In the Maritime Provinces the precipitation was chiefly snow, and was a little less than average, except in Cape Breton and Prince Edward Island.

SNOWFALL.

The total snowfall for the current month is given in Tables I and II, and its geographic distribution is shown on Chart VIII. Very little snow fell south of the thirty-fifth parallel, except over the Mountain and Plateau regions of the west. In Arizona and southern California there appears to have been considerable snowfall in the mountains, sufficient, so it is claimed, to insure an abundance of water for irrigation in the valleys below. The snowfall of eastern Montana, the Dakotas, and northern Minnesota was light for the season. Heavy snow, 10 to 20 inches or more, fell in eastern Kansas, Missouri, Iowa, southern Wisconsin, northern Illinois, and over the upper half of the lower peninsula of Michigan, also throughout northern New York and New England; the snowstorm of January 31 was particularly severe in the last-named district. Snow did not extend as far south as usual.

Snow on ground at end of month.—There were from 10 to 30 inches of snow on the ground at the end of the month in New England and northern New York; 20 to 40 in northern Michigan, and also on the upper peninsula; and about 10 inches in portions of New York, Michigan, Wisconsin, Illinois, Iowa, and Missouri. Elsewhere, excepting the mountainous regions of the far west, there was generally less than 5 inches. Since December 31, 1897, the snow covering has become heavier in New England and the upper Lake Region, and its southern limit in the Rocky Mountain Plateau Region has been extended to include the higher levels of Arizona and New Mexico. The southern limit of snow east of the Rocky Mountains is about the same as one month ago.

ICE IN THE RIVERS AND HARBORS AT THE CLOSE OF THE MONTH.

The Snow and Ice Chart of January 31, 1898, as prepared by the Climate and Crop Division, contains the following:

As compared with the corresponding date of 1897 there is now somewhat more ice at some stations in New England, the upper Lake Region, and in the upper Mississippi River, but in the Missouri River there is decidedly less, the ice at the close of January, 1897, ranging from 2 to 7 inches more than at this date. There was also very much more ice in the lower Lake Region and Middle Atlantic States at the close of January, 1897, than at this date. The Ohio River is now free from ice, and at the corresponding date last year it was frozen southward to Louisville, the ice ranging from 3 to 6 inches. On February 1, 1897, there was 6 inches of ice in the James River at Richmond, Va.

In Canada.—Prof. R. F. Stupart reports the following figures:

Medicine Hat, 24 inches, increase of 8 inches during the month; Minnedosa, 20 inches, increase of 2 inches; White River, 25 inches, increase of 3 inches; Parry Sound, 11 inches, increase of 7 inches; Rock-liffe, 12 inches, increase of 6 inches; Yarmouth, 11 inches, increase of 9 inches; Halifax, 2 inches.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 4, 9, 10, 20, 27. Arkansas, 11, 12, 21, 22. California, 8, 9, 10, 16, 22, 23, 24. Illinois, 9, 11, 12, 22, 25. Indiana, 9, 25. Iowa, 11. Kansas, 11. Kentucky, 22, 25. Louisiana, 21. Maryland, 25. Mississippi, 21. Missouri, 9, 11, 12, 14, 24, 25. Ohio, 25. Oklahoma, 11. Oregon, 6, 7, 8, 16, 17, 19, 21, 22, 23. Tennessee, 11, 25. West Virginia, 25.

SLEET.

The following are the dates on which sleet fell in the respective States:

Alabama, 29, 30. Arizona, 2, 9, 28. Arkansas, 29. California, 6, 8, 9, 10, 22, 23. Colorado, 29. Connecticut, 15, 20, 22, 23. Delaware, 9, 25, 31. District of Columbia, 25. Georgia, 11, 30. Illinois, 9, 12, 14, 15, 19, 20, 22, 25, 30. Indiana, 6, 10, 22, 24, 25, 26, 29, 30. Iowa, 11, 12, 19, 24, 25. Kansas, 10, 11, 12, 14, 18, 19, 24, 27. Kentucky, 6, 9, 11, 16, 29, 30, 31. Maine, 18. Maryland, 9, 10, 16, 19, 20, 22, 23, 25, 26, 31. Massachusetts, 1, 14, 15, 20, 23, 24. Michigan, 6, 9, 11, 19, 22, 25, 27. Minnesota, 11. Mississippi, 11. Missouri, 6, 7, 9, 10, 11, 14, 19, 20, 21, 22, 23, 24, 25, 29, 30, 31. Montana, 19, 27. Nebraska, 10, 11, 12, 23, 24, 25. New Hampshire, 1, 12, 13, 15, 20, 23. New Jersey, 1, 9, 10, 15, 19, 20, 22, 25, 31. New Mexico, 28. New York, 6, 8, 12, 15, 19, 20, 21, 22, 23, 25. North Carolina, 6, 17, 18, 19, 20, 25, 31. North Dakota, 27. Ohio, 5, 6, 9, 22, 24, 25, 26. Oklahoma, 11, 14, 18, 19, 23, 24, 29. Oregon, 2, 21, 23, 24, 29, 30. Pennsylvania, 9, 10, 12, 14, 16, 19, 20, 22, 23, 24, 25. Rhode Island, 31. South Carolina, 30, 31. South Dakota, 10, 22. Tennessee, 14, 16, 19, 29, 31. Texas, 13, 18, 19. Utah, 10, 26, 28. Vermont, 14, 15, 19, 22, 23, 26. Virginia, 9, 18, 19, 20, 25, 31. Washington, 2, 3, 5, 7, 8, 9, 10, 14, 17, 18, 20, 22. West Virginia, 9, 19, 20, 24, 25. Wisconsin, 11, 12, 13, 19.

HUMIDITY.

The humidity observations of the Weather Bureau are divided into two series; the first or tridaily series began in 1871 and ended with 1887; the second or twice-daily series is continuous from 1888 to the present time.

In the present state of knowledge respecting the diurnal variation in the moisture of the air, we are scarcely warranted in combining the two series in a general mean.

The monthly means of the second or present series are based upon observations of the whirled psychrometer at 8 a. m. and 8 p. m., seventy-fifth meridian time, which corresponds to 5 a. m. and 5 p. m., Pacific; 6 a. m. and 6 p. m., Mountain; and 7 a. m. and 7 p. m., Central standard time.

In using the table by means of which the amount of moisture in the air is computed from the readings of the wet and dry bulb thermometers, the pressure argument has almost always been neglected, an omission that has little significance except for low temperatures and at high stations, such as Santa Fe, El Paso, Cheyenne, and a few others. The failure to apply a correction for the influence of the prevailing pressure on the psychrometer has the effect of making the monthly means of relative humidity at high level stations too small by quantities ranging from 5 to 10 per cent. In the application of the monthly averages of the table below, or those of individual stations in Table I, to special inquiries, whether in the departments of biology, climatology, or sanitary science, this fact should be kept in mind. It should also be remembered that the hours at which observations in the Rocky Mountain Plateau Region are made, viz, from 5 to 6 local mean time, morning and afternoon, give approximately the maximum and minimum values for the day; therefore, monthly means calculated from such hours approach more nearly the true mean of the month than is the case on the Atlantic seaboard and in the seventy-fifth meridian time belt.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	76	0	Missouri Valley	78	0
Middle Atlantic	73	0	Northern Slope	78	+2
South Atlantic	76	-2	Middle Slope	72	+3
Florida Peninsula	79	-3	Southern Slope	64	0
East Gulf	82	+4	Southern Plateau	52	+1
West Gulf	77	+2	Middle Plateau	73	+4
Ohio Valley and Tennessee	79	+2	Northern Plateau	84	+3
Lower Lake	80	-1	North Pacific Coast	83	-4
Upper Lake	83	+1	Middle Pacific Coast	72	-9
North Dakota	78	-3	South Pacific Coast	67	-7
Upper Mississippi Valley	79	+1			

The normal for any district can be obtained by adding the departure to the average of the current month when the current humidity is below the normal (—), and subtracting it when it is above (+).

The great dryness on the Pacific Coast is the only notable feature of the month.

WIND.

High winds and local storms.—The winds of the month were not as boisterous as usual, except on the 20th, and again on the 23d, 24th, and 25th. Maximum wind velocities of 50 miles per hour and over occurred in Tennessee, the Ohio Valley, and the Lake Region on the 20th, but the damage done was mostly of a minor character.

The maximum velocities during the storm of the 22-23d in the Lake Region were 72 miles per hour from the west at Cleveland, 68 from the west at Buffalo, 66 from the northeast at Chicago; on the Atlantic Coast, 61 miles from the west at New York, and 60 from the east at Eastport.

Following are the velocities of 50 miles and over per hour registered during the month:

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
		Miles				Miles	
Abilene, Tex.	25	60	w.	El Paso, Tex.	24	62	sw.
Amarillo, Tex.	11	56	sw.	Erie, Pa.	30	50	s.
Atlantic City, N. J.	26	50	nw.	Fort Canby, Wash.	13	50	se.
Block Island, R. I.	1	50	nw.	Do.	18	69	se.
Do.	31	60	ne.	Do.	21	54	se.
Buffalo, N. Y.	2	58	w.	Harrisburg, Pa.	23	52	w.
Do.	3	54	w.	Indianapolis, Ind.	30	54	sw.
Do.	8	52	sw.	Do.	22	54	sw.
Do.	20	55	w.	Do.	23	56	sw.
Do.	21	50	w.	Do.	25	55	nw.
Do.	23	68	w.	Knoxville, Tenn.	30	54	sw.
Cairo, Ill.	22	56	sw.	Lexington, Ky.	23	60	sw.
Do.	25	53	sw.	Do.	25	56	w.
Chattanooga, Tenn.	22	58	sw.	Louisville, Ky.	25	53	w.
Chicago, Ill.	2	54	sw.	Memphis, Tenn.	22	50	sw.
Do.	22	66	ne.	Do.	25	52	w.
Do.	25	65	ne.	Nantucket, Mass.	31	71	se.
Cleveland, Ohio	23	72	w.	New York, N. Y.	23	61	w.
Eastport, Me.	1	52	e.	Do.	24	50	nw.
Do.	23	60	e.	Port Huron, Mich.	23	56	w.
El Paso, Tex.	11	55	nw.	St. Louis, Mo.	25	66	sw.
Do.	23	54	sw.	Woods Hole, Mass.	3	52	sw.

In the west much snow fell throughout Kansas, Nebraska, Iowa, Missouri, Wisconsin, Illinois, Indiana, Michigan, and Ohio. In Illinois, Wisconsin, and Michigan the snow drifted badly, completely blocking street car traffic in many cities and greatly delaying it in others. Electric wires of all descriptions suffered greatly, owing to the moist character of the snow.

Much damage was done by the gale in the Ohio Valley. In a number of towns buildings were unroofed, windows broken, fences, telegraph, and telephone poles were blown down, while the floods in small rivers and their tributaries added, in some cases, to the destruction already caused by the winds. The storm did not abate in severity in its course to the Atlantic.

One of the most severe wind and snow storms of recent

times swept over New England at the close of the month. Further notice of its severity is reserved for the February issue.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Tornadoes.—Tornadoes have occurred in January in some parts of the United States south of the thirty-eighth parallel in five out of the last ten years.

The tornado which wrought so great destruction of life and property at Fort Smith on the 12th, an account of which appears elsewhere in this REVIEW, does not seem to have been unusually severe or unlike tornadoes that have hitherto been experienced in January. Unfortunately it passed directly through the business and residence portion of the chief city of western Arkansas. Three other storms were observed during the month having the characteristics of tornadoes. The details of each follow:

(1) January 9, 3:50 p. m. (central time), Morganfield, Ky.: One killed; property loss from \$12,000 to \$18,000. Path of great destruction 30 to 40 feet wide, 750 feet long; moved northeast.

(2) January 12, 12:42 a. m. (local time), Fort Smith, Ark.: Thirty-three killed outright, 19 died from injuries; 73 injured; property loss \$450,000. Path of great destruction 300 feet wide, 1 mile long; moved east, 17° north.

(3) January 11, 11 p. m. (central time), Bradleyville, Mo.: One killed, 5 injured; property loss, \$3,000. Path of great destruction 300 yards wide 5 miles long; moved northeast. Bradleyville, Mo., is about 125 miles due northeast of Fort Smith, Ark. It would, therefore, appear that the conditions were favorable for the development of tornadoes throughout the central portion of the low area that formed over Arkansas and Missouri on the night of the 11-12th.

(4) January 16, 7 p. m. (central time), Maud, Okla.: No loss of life; 6 buildings destroyed. Path of storm 300 feet wide, length unknown; moved toward the northeast.

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 21 regular stations of the Weather Bureau by its photographic, and at 47 by its thermal effects. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table IX for each hour of local mean time. In order to complete the record of the duration of cloudiness these registers are supplemented by special personal observations of the state of the sky near the sun in the hours after sunrise and before sunset, and the cloudiness for these hours has been added as a correction to the instrumental records, whence there results a complete record of the duration of sunshine from sunrise to sunset.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table IX for the stations at which instrumental self-registers are maintained.

The percentage of clear sky (sunshine) for all of the stations included in Table I, obtained as described in the preceding paragraph, is graphically shown on Chart VII. The regions of cloudy and overcast skies are shown by heavy shading; an absence of shading indicates, of course, the prev-

alence of clear, sunshiny weather. The formation of fog and cloud is primarily due to differences of temperature in a relatively thin layer of air next to the earth's surface. The relative position of land and water surfaces often greatly increases the tendency to form areas of cloud and fog. This principle is perhaps better exemplified in the Lake Region than elsewhere, although it is of quite general application. The percentage of sunshine on the lee shores of the Lakes is always much less than on the windward shores. Next to the permanent influences that tend to form fog and cloud may be classed the frequency of the passage of cyclonic areas. The greater number of such areas during the current month moved from Texas to the Lake Region by way of the Mississippi and Ohio valleys. As might be expected, an area of diminished sunshine appears on the chart almost coincident with the average path of the cyclonic storms of the month. It is to be noticed, moreover, that the percentage of sunshine diminishes rapidly as the Lake Region is approached, particularly in the Ohio Valley.

The stations that have the least sunshine are Rochester, Grand Haven, Erie, Pittsburg, Parkersburg, Buffalo, Sandusky, and Oswego; the greatest are Yuma, Key West, Tampa, Lander, Yankton, Bismarck, Redbluff, Pierre, North Platte, San Diego, Williston, El Paso, and Jupiter.

The average cloudiness by geographic districts, and the departure from the normal conditions are given in the table below. The mean values have been computed from the numerical data of Table I.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	5.6	-0.2	Missouri Valley	5.0	-0.1
Middle Atlantic	6.2	+0.6	Northern Slope	4.3	-0.3
South Atlantic	4.8	-0.5	Middle Slope	4.9	+1.1
Florida Peninsula	3.3	-1.4	Southern Slope	4.8	+0.8
East Gulf	5.7	+0.1	Southern Plateau	3.8	+0.9
West Gulf	5.9	+0.5	Middle Plateau	4.9	+0.1
Ohio Valley and Tennessee.	6.8	+0.4	Northern Plateau	6.8	-0.5
Lower Lake	8.0	+0.5	North Pacific Coast	7.5	+0.4
Upper Lake	6.8	0.0	Middle Pacific Coast	4.8	-0.3
North Dakota	4.0	-0.7	South Pacific Coast	4.6	+0.5
Upper Mississippi Valley ..	5.5	+0.2			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 25th, 223; 11th, 141; 12th, 128; 22d, 81; and 9th, 78.

Reports were most numerous from Missouri, 109; Ohio, 105; Indiana, 85; and Arkansas, 75.

In Canada.—Thunderstorms were reported at Grand Manan, 23d; Yarmouth, 13th, 23d; Toronto and Port Stanley, 12th.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 3d to the 11th, inclusive.

The greatest number of reports were received for the following dates: 16th, 26; 18th, 15; 17th, 9.

Reports were most numerous from Montana, 13; North Dakota, 13; Illinois, 7; Minnesota and Ohio, 6 each.

In Canada.—Auroras were reported as follows: Father Point, 17, 18, 25; Port Arthur, 1, 19; Winnipeg, 16, 18; Minnedosa, 1, 10, 16, 17, 20, 25, 28; Qu'Appelle, 16, 21, 22; Medicine Hat, 16; Swift Current, 17, 26; Prince Albert, 25; Battleford, 16, 26.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Snowfall and rainfall are expressed in inches.

Alabama.—The mean temperature was 49.6°, or 5.0° above normal; the highest was 88°, at Mount Willing on the 10th, and the lowest, 11°, at Hamilton on the 1st and at Opelika and Valleyhead on the 3d. The average precipitation was 5.80, or about 1.34 below normal; the greatest monthly amount, 8.28, occurred at Riverton, and the least, 0.82, at Clanton.—*F. P. Chaffee.*

Arizona.—The mean temperature was 39.5°, the highest was 83°, at Buckeye on the 3d, and the lowest, 23° below zero, at Fort Defiance on the 25th. The average precipitation was 2.23; the greatest monthly amount, 5.70, occurred at Pinal Ranch, while none fell at Fort Mohave and Texas Hill.—*W. T. Blythe.*

Arkansas.—The mean temperature was 45.5°, or 6.0° above normal; the highest was 81°, at Beebranch on the 10th, and the lowest, 10°, at Keesees Ferry, Lacrosse, and Newport on the 2d. The average precipitation was 7.93, or 3.81 above normal; the greatest monthly amount, 14.50, occurred at Pinebluff, and the least, 2.11, at Witts Springs.—*F. H. Clarke.*

California.—The mean temperature was 41.0°, or 3.7° below normal; the highest was 88°, at Nordhoff on the 1st and 2d, and the lowest, 24° below zero, at Bodie on the 11th. The average precipitation was 1.08, or 2.82 below normal; the greatest monthly amount, 6.37, occurred at Morses House, while none fell at several stations.—*W. H. Hammon.*

Colorado.—The mean temperature was 21.2°, or 2.5° below normal; the highest was 80°, at Minneapolis on the 4th, and the lowest, 36° below zero, at Rangely on the 25th and at Steamboat Springs on the 26th. The average precipitation was 0.60, or about 0.20 below normal; the greatest monthly amount, 3.50, occurred at Ruby, while none fell at Fort Morgan and Walleet.—*F. H. Brandenburg.*

Florida.—The mean temperature was 60.4°, or slightly above normal; the highest was 90°, at Kissimmee on the 19th, and the lowest, 16°, at Jasper on the 3d. The average precipitation was 0.74, or decidedly below normal; the greatest monthly amount, 2.06, occurred at Quincy, while none fell at Lemon City.—*A. J. Mitchell.*

Georgia.—The mean temperature was 51.2°, or 4.4° above normal; the highest was 88°, at Bellville on the 11th and 22d, and the lowest, 9°, at Hawkinsville on the 2d. The average precipitation was 2.51, or 2.27 below normal; the greatest monthly amount, 7.13, occurred at Greenbush, and the least, 0.23, at Brag.—*J. B. Marbury.*

Idaho.—The mean temperature was 17.6°; the highest was 60°, at Challis on the 1st, and the lowest, 40° below zero, at Rexburg on the 24th. The average precipitation was 1.43; the greatest monthly amount, 3.40, occurred at Marysville, and the least, 0.22, at Pollock.—*D. P. McCallum.*

Illinois.—The mean temperature was 30.6°, or 5.5° above normal; the highest was 70°, at Cairo on the 9th and at Cisne and Mount Vernon on the 12th; the lowest was 8° below zero, at Scales Mound on the 29th. The average precipitation was 4.20, or 1.44 above normal; the greatest monthly amount, 7.11, occurred at Grayville, and the least, 1.85, at Lanark.—*C. E. Linney.*

Indiana.—The mean temperature was 33.4°, or 6.8° above normal; the highest was 70°, at Rockville on the 12th, and the lowest, 2° below zero, at Richmond on the 2d. The average precipitation was 5.27, or 2.21 above normal; the greatest monthly amount, 11.60, occurred at Vevay, and the least, 0.82, at Logansport.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 23.4°, or considerably above normal; the highest was 52°, at Keokuk on the 7th, and the lowest, 11° below zero, at Cedar Rapids on the 27th. The average precipitation was 1.60, or nearly normal; the greatest monthly amount, 5.32, occurred at Ovid, and the least, trace, at Mason City.—*G. M. Chappel.*

Kansas.—The mean temperature was 31.9°, or 3.8° above normal; the highest was 75°, at Fallriver and Ottawa on the 11th, and the lowest, 3° below zero, at Minneapolis on the 26th. The average precipitation was 1.72, or 0.79 above normal; the greatest monthly amount, 4.97, occurred at Sedan, and the least, 0.04, at Colby.—*T. B. Jennings.*

Kentucky.—The mean temperature was 40.0°, or 5.5° above normal; the highest was 72°, at Ashland and Frankfort on the 12th, and the lowest, 6°, at Vanceburg on the 3d. The average precipitation was 8.76, or 4.50 above normal; the greatest monthly amount, 11.99, occurred at Bowling Green, and the least, 5.85, at Sergeant.—*D. J. O'Connor.*

Louisiana.—The mean temperature was 55.5°, or over 4.0° above normal; the highest was 87°, at White Sulphur Springs on the 12th,

and the lowest, 12°, at Mansfield on the 2d. The average precipitation was 6.32, or about 1.00 above normal; the greatest monthly amount, 12.25, occurred at Oakridge, and the least, 0.80, at Port Eads.—*R. E. Kerkam.*

Maryland and Delaware.—The mean temperature was 35.5°, or 4.2° above normal; the highest was 72°, at Grantsville, Md., on the 15th, and the lowest, 2° below zero, at Deepark, Md., on the 30th. The average precipitation was 3.57, or 0.37 above normal; the greatest monthly amount, 8.95, occurred at Sunnyside, Md., and the least, 1.24, at Pocomoke City, Md.—*F. J. Walz.*

Michigan.—The mean temperature was 23.9°, or 2.7° above normal; the highest was 63°, at Coldwater and Grape on the 12th, and the lowest, 19° below zero, at Humboldt on the 28th and at Omer on the 30th. The average precipitation was 2.91, or 0.48 above normal; the greatest monthly amount, 5.30, occurred at Manistee, and the least, 0.47, at Iron River.—*C. F. Schneider.*

Minnesota.—The mean temperature was 18.3°, or about 9.0° above normal; the highest was 49°, at Luverne on the 6th and at Collegeville on the 18th, and the lowest, 36° below zero, at Tower on the 28th. The average precipitation was 0.16, or 0.70 below normal; the greatest monthly amount, 0.87, occurred at St. Charles.—*T. S. Outram.*

Mississippi.—The mean temperature was 51.0°, or 5.2° above normal; the highest was 89°, at Mayersville on the 12th, and the lowest, 10°, at Ripley and French Camp on the 2d and at Yazoo City on the 7th. The average precipitation was 7.22, or 1.72 above normal; the greatest monthly amount, 13.58, occurred at Austin, and the least, 1.68, at Poplarville.—*R. J. Hyatt.*

Missouri.—The mean temperature was 34.3°, or 6.0° above normal; the highest was 75°, at Lamar on the 11th, and the lowest, 10° below zero, at Potosi on the 2d. The average precipitation was 3.97, or 1.95 above normal; the greatest monthly amount, 7.31, occurred at Poplarbluff, and the least, 1.98, at Houston.—*A. E. Hackett.*

Montana.—The mean temperature was 22.3°, or greatly above normal; the highest was 64°, at Greatfalls on the 31st, and the lowest, 22° below zero, at Augusta on the 9th. The average precipitation was 0.36, or less than normal; the greatest monthly amount, 1.61, occurred at Columbia Falls, and the least, trace, at Poplar and Wibaux.—*J. Warren Smith.*

Nebraska.—The mean temperature was 27.0°, or about 9.0° above normal; the highest was 63°, at Beatrice on the 6th, and the lowest, 20° below zero, at Camp Clark on the 26th. The average precipitation was 0.67, or about normal; the greatest monthly amount, 2.75, occurred at Rulo, while none fell at Haigler.—*G. A. Loveland.*

Nevada.—The mean temperature was 20.4°, or 6.8° below normal; the highest was 63°, at Candelaria on the 2d and 4th, and the lowest, 28° below zero, at Elko on the 11th. The average precipitation was 0.69, or about half the usual amount; the greatest monthly amount, 2.90, occurred at Verdi, and the least, trace, at Carlin and Hot Springs.—*R. F. Young.*

New England.—The mean temperature was 21.9°, or 1.1° below normal; the highest was 58°, at Somerset, Mass., on the 13th, and the lowest, 39° below zero, at Flagstaff, Me., on the 29th. The average precipitation was 5.03, or 1.14 above normal; the greatest monthly amount, 8.06, occurred at Jacksonville, Vt., and the least, 2.60, at Burlington, Vt.—*J. W. Smith.*

New Jersey.—The mean temperature was 32.6°, or nearly 3.0° above normal; the highest was 64°, at Moorestown on the 23d, and the lowest, 10° below zero, at Rivervale and Englewood on the 30th. The average precipitation was 4.20, or nearly normal; the greatest monthly amount, 5.90, occurred at Englewood, and the least, 2.79, at Clayton.—*E. W. McGann.*

New Mexico.—The mean temperature was 31.3°, or 3.3° below normal; the highest was 78°, at Eddy on the 3d, and the lowest, 24° below zero, at Buckmans on the 19th. The average precipitation was about normal; the greatest monthly amount, 2.43, occurred at Winsors, and the least, trace, at Angle.—*H. B. Hersey.*

New York.—The mean temperature was 24.6°, or 1.5° above normal; the highest was 62°, at Westfield on the 12th and 13th, and the lowest, 37° below zero, at Canton on the 30th. The average precipitation was 3.89, or 0.98 above normal; the greatest monthly amount, 7.20, occurred at Keene Valley, and the least, 1.33, at Fleming.—*R. M. Hardinge.*

North Carolina.—The mean temperature was 44.3°, or about 0.4° above normal; the highest was 80°, at Newbern on the 12th, and the lowest, zero, at Highlands on the 2d. The average precipitation was 2.63, or nearly 2.00 below normal; the greatest monthly amount, 6.40, occurred at Bryson City, and the least, 1.40, at Fairbluff and Wilmington.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 15.0°, or 11.8° above normal; the highest was 69°, at Berthold Agency on the 4th, and the

lowest, 32° below zero, at McKinney on the 31st. The average precipitation was 0.13, or 0.46 below normal; the greatest monthly amount, 0.65, occurred at Napoleon, and the least, trace, at a number of stations.—*B. H. Bronson.*

Ohio.—The mean temperature was 32.4°, or 5.0° above normal; the highest was 71°, at Canton on the 12th, and the lowest, 18° below zero, at Levering on the 2d. The average precipitation was 5.25, or 2.00 above normal; the greatest monthly amount, 11.69, occurred at Cherryfork, and the least, 2.53, at Dupont. The month was the wettest January for sixteen years.—*H. W. Richardson.*

Oklahoma.—The mean temperature was 40.0°; the highest was 77°, at Anadarko on the 11th, and the lowest, 7°, at Clifton. The average precipitation was 3.09; the greatest monthly amount, 5.86, occurred at Tablequah, and the least, 0.80, at Putnam.—*J. I. Widmeyer.*

Oregon.—The mean temperature was 34.3°, or 0.4° below normal; the highest was 64°, at Ashland and Langlois, and the lowest, 21° below zero, at Burns. The average precipitation was 3.87, or 2.56 below normal; the greatest monthly amount, 14.26, occurred at Bay City, and the least, 0.27, at Silverlake.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 30.7°, or 3.4° above normal; the highest was 67°, at Greensboro and Pittsburg on the 12th, and the lowest, 16° below zero, at Lawrenceville, on the 2d. The average precipitation was 4.25, or 0.73 above normal; the greatest monthly amount, 7.57, occurred at Johnstown, and the least, 1.32, at Reedsville.—*T. F. Townsend.*

South Carolina.—The mean temperature was 49.2°, or 3.2° above normal; the highest was 82°, at Trial on the 10th, and the lowest, 8°, at Central on the 2d. The average precipitation was 1.80, or 2.60 below normal; the greatest monthly amount, 4.06, occurred at Central, and the least, 0.19, at Charleston and Yemassee.—*J. W. Bauer.*

South Dakota.—The mean temperature was 22.8°, or about 12.0° above normal; the highest was 63°, at Harney on the 2d, and the lowest, 22° below zero, at Eureka on the 29th. The average precipitation was 0.24, or 0.28 below normal; the greatest monthly amount, 1.50, occurred at Oelrichs, while none fell at several stations.—*S. W. Glenn.*

Tennessee.—The mean temperature was 43.8°, or about 5.5° above normal; the highest was 75°, at Chattanooga and St. Joseph on the 11th and at Newport on the 12th, and the lowest, 3°, at Silverlake on the 2d. The average precipitation was 8.81; in the eastern portion it was 2.50 above normal; in the middle, 4.25; and in the western, 6.75; the greatest monthly amount, 14.86, occurred at Trenton, and the least, 4.02, at Bristol.—*H. C. Bate.*

Texas.—The mean temperature for the State was 2.4° above the normal. There was a general excess in all sections, except over the panhandle, where it was about the normal, and over west Texas, where there was a slight deficiency, with the greatest, 2.3°, in the vicinity of El Paso. The excess was slight over north Texas and in

localities over the east coast district, while it ranged from 2.2° to 6.4° over central, southwest, and east Texas, and the western portion of the coast district, with the greatest in the vicinity of Palestine. The highest was 91°, at Fort Ringgold on the 24th, and the lowest, 5°, at Tulia on the 20th. The average precipitation for the State was 0.51 below the normal. There was a slight excess along the immediate east coast and over the panhandle and north Texas, with the greatest, 2.84, in the vicinity of Longview, while there was a general deficiency over the other portions of the State, but the deficit was comparatively light, not amounting to as much as 1.00, except over the eastern portion of southwest Texas and the central and western portions of the coast district, where it ranged from 1.00 to 3.03, with the greatest in the vicinity of Brazoria. The greatest monthly amount, 9.42, occurred at Longview, while none fell at several stations.—*I. M. Cline.*

Utah.—The mean temperature was 16.9°; the highest was 60°, at Thistle on the 1st, and the lowest, 34° below zero, at Fort Duchesne on the 25th. The average precipitation was 1.07; the greatest monthly amount, 2.65, occurred at Pahreah, and the least, 0.15, at Fillmore.—*J. H. Smith.*

Virginia.—The mean temperature was 39.9°, or about 3° or 4° above normal; the highest was 79°, at Cape Henry on the 22d, and the lowest, 2°, at Burkes Garden and Monterey on the 2d. The average precipitation was 2.62, or 1.76 below normal; the greatest monthly amount, 6.40, occurred at Bigstone Gap, and the least, 1.05, at Richmond.—*E. A. Evans.*

Washington.—The mean temperature was 32.6°, or nearly normal; the highest was 61°, at Clearwater on the 1st, and the lowest, 9° below zero, at Fort Spokane on the 24th. The average precipitation was 3.16, or 2.00 below normal; the greatest monthly amount, 15.62, occurred at Clearwater, and the least, trace, at Bridgeport.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 37.1°, or about 3.0° above normal; the highest was 75°, at Uppertract on the 13th, and the lowest, 5° below zero, at Powellton on the 2d. The average precipitation was 5.10, or about 1.50 above normal; the greatest monthly amount, 8.04, occurred at Point Pleasant, and the least, 2.24, at Green Sulphur Springs.—*H. L. Ball.*

Wisconsin.—The mean temperature was 21.3°, or about 5.0° above normal; the highest was 55°, at North Crandon on the 18th, and the lowest, 22° below zero, at the same station on the 31st. The average precipitation was 1.22, or slightly below normal; the greatest monthly amount, 4.00, occurred at Port Washington, and the least, 0.03, at Osceola.—*W. M. Wilson.*

Wyoming.—The mean temperature was 17.7°, or 5.1° below normal; the highest was 60°, at Fort Laramie on the 3d, and the lowest, 40° below zero, at Greenriver on the 26th. The average precipitation was 0.55, or 0.11 below normal; the greatest monthly amount, 1.55, occurred at Greenriver, and the least, trace, at Otto.—*W. S. Palmer.*

RIVER AND FLOOD SERVICE.

By PARK MORRILL, Forecast Official, in charge of River and Flood Service.

After a fall during the earlier part of January, the Ohio and its chief tributaries, the Cumberland and Tennessee, rose rapidly until about the 25th. The consequent rise in the lower Mississippi was sharp and continuous to the end of the month. On the last day the stage at Cairo was 4.4 feet above the danger line; the river at Memphis had reached the danger line and was less than a foot below at Vicksburg. The western tributaries are all at low stages and, as the Ohio flood is fast running out, no serious conditions will arise from the precipitation which has already fallen. The lower river, however, is well filled, and heavy rainfall in the early part of February would cause a flood.

The highest and lowest water, mean stage, and monthly range at 117 river stations are given in the accompanying table. Hydrographs for typical points on seven principal rivers are shown on the accompanying chart. The stations selected for charting are: Keokuk, St. Louis, Cairo, Memphis, and Vicksburg, on the Mississippi; Cincinnati, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.

The following résumé of river stages and conditions of navigation in the respective streams is compiled from reports by the officials of the Weather Bureau at various river stations and section centers:

Hudson River. (Reported by A. F. Sims, Albany, N. Y.)—On the 1st of January, notwithstanding an air temperature of 4° below zero, a few open spots were still to be seen at places here and there in the tide-water portion of the Hudson, due to the water being kept in a state of agitation. On the 4th the snow on the watershed area of the Hudson averaged 8 inches. The ice formation in the principal ice-harvesting districts is very lumpy, which necessitates much planing prior to its being housed.

On the 18th the snow on the watershed of the Hudson ranged from 9 inches at Saranac to a trace at Poughkeepsie, and the ice in the Hudson River ranged from 10 inches at Waterford to floating ice at Newburg. The ice was massed in huge blocks, rendering ice harvesting impracticable, and even preventing persons from crossing. In front of many houses along the river there is a jumbled mass of broken ice piled many feet and in the ice channels extending down to the bottom. The best ice will be harvested from behind the dikes and in the creeks.

The weather and temperature conditions of the 23d rendered the ice mushy and so soft that a pike pole could be sunk to the depth of several inches. On the 24th the river from the Poughkeepsie bridge to New York was entirely free of ice; all ferryboats below Poughkeepsie were running. At Albany the ice was piled in jagged masses. At Vanwies Point a smooth unbroken surface of clear ice, extending from shore to shore, began and remained unbroken to a point a short distance above Poughkeepsie bridge. From Fishkill to New York there was nothing to indicate that the river had been frozen, not even a cake of ice was seen on the river banks, except in places behind the dikes.

The end of the month finds the watershed of the Hudson with a good covering of snow, and the river with a good quality of ice, except at Albany, where no ice can be harvested this season on account of the gorge formation.

Susquehanna River. (Reported by E. R. Demain, Harrisburg, Pa.)—The waters of the Susquehanna and its tributaries were higher than is

usual during the month of January and decidedly above the stages prevailing in January, 1897. In the latter month twelve stations gave an average gauge reading of 2.0 feet and sixteen stations an average precipitation of 1.74 inch. For January, 1898, the average gauge reading of eighteen stations was 3.8 feet and the average rainfall 3.36 inches. The cold spell, beginning the last day of December and continuing several days into January, caused a general closing of the North and West branches, which remained icebound from thirteen to fifteen days.

The only flood of any consequence during the month occurred at Wilkesbarre. The ice broke up suddenly on the morning of the 15th and moved out before daylight, and for a short time the river was free of ice; about noon slush ice began to run. The river rose rapidly during the afternoon, reaching a height of 19 feet on the gauge, 5 feet above the danger line. This sudden rise was due to an ice gorge at Nanticoke, a town 8 miles below Wilkesbarre. This portion of the river is narrow and the flow rapid, the mountains coming down abruptly on either side to the edge of the stream. The floods caused stoppage of the street cars and the suspension of all traffic between Wilkesbarre and Kingston, on the opposite side of the river, for two days. Westmoreland, a place of 1,000 population, was also cut off. The gorge at Nanticoke broke up on the 16th and the river fell rapidly. The conditions at Wilkesbarre are such that high waters are dreaded. A stage of 25 feet floods the lower end of the city. At a stage of 20 feet the openings to many of the mines are banked up and frequently the men are called out.

The following data relative to the closing and opening of the Susquehanna at Harrisburg since 1870 was kindly furnished by Mr. Wm. A. Kelker, of Harrisburg:

The Susquehanna River at Harrisburg.

Icebound.	Opened.	Icebound.	Opened.
Dec. 29, 1870	Jan. 15, 1871	Dec. 8, 1882	Feb. 5, 1883
Feb. 12, 1871	Feb. 17, 1871	Dec. 24, 1883	Feb. 7, 1884
Dec. 30, 1871	Mar. 23, 1872	Jan. 25, 1885	Apr. 1, 1885
Dec. 22, 1872	Jan. 18, 1873	Jan. 15, 1886	Feb. 13, 1886
Jan. 29, 1873	Feb. 7, 1873	Mar. 3, 1886	Mar. 5, 1886
Feb. 24, 1873	Mar. 11, 1873	Jan. 3, 1887	Jan. 25, 1887
Jan. 10, 1875	Feb. 27, 1875	Jan. 20, 1888	Feb. 22, 1888
Dec. 10, 1876	Feb. 3, 1877	Dec. 25, 1892	Feb. 10, 1893
Jan. 8, 1878	Jan. 12, 1878	Dec. 29, 1894	Jan. 10, 1895
Dec. 26, 1878	Mar. 8, 1879	Jan. 9, 1896	Jan. 25, 1896
Dec. 10, 1880	Feb. 11, 1881	Jan. 27, 1897	Feb. 7, 1897

Rivers of the South Atlantic States. (Reported by E. A. Evans, Richmond, Va.; C. F. von Herrman, Raleigh, N. C.; L. N. Jesunofsky, Charleston, S. C.; D. Fisher, Augusta, Ga.; and J. B. Marbury, Atlanta, Ga.)—Notwithstanding a marked deficiency in precipitation over the major portion of the James River basin, the water remained at about its normal height. As compared with January, 1897, it showed a slight increase on practically the same amount of precipitation. The month opened with stages a little above zero. A slight fall occurred on the 4th to -0.1 foot, which was the lowest reading for the month, and it remained stationary at this point until the 12th, on which date it began to rise slowly. Intermittent rains during the next eleven days sufficed to keep the stream above zero of the gauge, and during this period a moderate rise of about 2 feet occurred. Thereafter, until the close of the month, it remained above zero. Navigation was unimpeded from this station to the mouth of the river. Above the falls thin ice formed early in the month in shallow and sheltered places. The volume of water was amply sufficient for milling purposes on the James and its tributaries, and was quite free from sediment and discoloration.

No noteworthy events in connection with the condition of the rivers in North Carolina occurred during January, 1898. The number of days with precipitation was about the average, but the amounts were very small, and on account of the unusually mild winter had less influence than if the soil had been frozen. No accumulation of snow has taken place even in the mountains, and ice formed in the upper streams to considerable thickness only on the first few days of the month in the extreme west.

There were two periods during the month when the streams of South Carolina were navigable, viz, from the 1st to the 6th and from the 24th to the 31st. Early in January river men and lumbermen were hopeful of good steamboat water the entire month, but during the first two decades scarcely sufficient rainfall occurred to maintain navigable stages, and all streams fell rapidly, thereby causing a tie up of most steamers. The general and moderate rainfall on the 24th and 25th swelled the streams to fair proportions, and navigation was fully resumed again by the 26th. The Waccamaw, from Winyah Bay to Conway, was the only stream in the State which was navigable during the entire month. This condition is attributable to the thorough "snagging" the stream has received within the past two years, thus admitting steamers of light draft to ply its waters at very low stages. Between the 6th and 23d the streams on the west side of the Appalachian Range all flooded, while on the eastern side they were at very low stages. The lumber interests have suffered to a great extent on account of low water. There is very much timber cut in the swamps and ready to be floated.

In January, 1897, fully one-half of the timber cut up to that time was floated and boomed successfully, while during the past month less than 10 per cent of the season's output has been floated.

There was a marked deficiency of rainfall throughout the Savannah Valley during the month but, notwithstanding this shortage, the river averaged higher than for the past four months, and a fairly good boating stage was maintained all the time. The heavy rains which were general over the upper basin on the 25th caused the water to rise to a height of 16.7 feet at Augusta a few days later, which was the highest stage reached since August 22, but the volume of water thus obtained was soon carried away, and the end of the month found the river a little over 8 feet, which, however, is ample for river traffic. As the exigencies of improved trade called for another steamer, the *Ethel*, which had been withdrawn during the previous month, was again pressed into service, and, together with the *Cook*, made regular trips. There was a marked improvement noted in the volume of business transacted.

During the early part of the month but little rain fell and low water continued in the streams of western Georgia throughout the month. Heavy rain fell in the watershed of the Coosa and Oostanaula on the 25th, causing a marked rise in the river at Resaca on the 26th, and at Rome on the day after. The river at Rome rose 7 feet between the morning observation of the 26th and that of the 27th, when 14.5 feet, the highest point for the month, was reached. The highest point reached at Resaca was 17.1 feet on the morning of the 26th, a rise of 8.3 feet in twenty-four hours. Water too low for navigation continues at nearly all points.

Mobile River and branches. (Reported by F. P. Chaffee, Montgomery, Ala., and W. M. Dudley, Mobile, Ala.)—There was a gradual decline in the Alabama River and tributaries during the first decade, the rainfall during that period being too light to check the fall in the rivers. Well distributed rains during the second decade gave gradual rises to the 23d, and heavy rains near the headwaters on the 24th and 25th caused rapid rises in the Coosa on the 26th, reaching nearly the danger line at Gadsden on the 28th, after which there was a gradual fall in rivers. Navigable stages prevailed in the Alabama and Coosa during the entire month, steamers making regular trips on the Alabama with good freights, and during the last five days of the month considerable timber was rafted on the rivers of this system.

No appreciable rainfall occurred on the Tombigbee watershed until the 6th, when a moderately heavy fall was reported. This made no material change in river stages, but the rain which fell on the 11th caused material rises in the Tombigbee and Warrior. On the 13th a light but general rain fell, causing rises in all the rivers. The rain on the 15th caused continued and marked rises to the 19th. Rain on the morning of the 20th caused anticipation of flood stages, and a warning was sent to the river observers at Tuscaloosa and Demopolis, stating that the river would probably reach danger line by the morning of the 21st. Slight falls occurred on the upper Tombigbee and Warrior rivers on the 22d, but the rain which fell on the 24th and the heavy rain on the morning of the 25th caused general rises, and a warning was again sent to Tuscaloosa and Demopolis. The upper Tombigbee and Warrior rivers began falling on the morning of the 27th, but the rise continued on the lower Tombigbee from Demopolis down. The river stages throughout the month have been favorable to navigation on the Mobile, Tombigbee, and Warrior rivers. While the stages continued low during the first ten days of the month, there has been a general and marked rise in all river stages from that time, giving quite high stages in the Tombigbee and Warrior rivers to the close of the month.

Ohio River and minor branches. (Reported by F. Ridgway, Pittsburg, Pa.; H. L. Ball, Parkersburg, W. Va.; S. S. Bassler, Cincinnati, Ohio; S. P. Gresham, Louisville, Ky.; and P. H. Smyth, Cairo, Ill.)—Considering the season of the year, the month has been one of exceptional activity in navigation. During the first few days only a fair packet stage obtained, but this was quickly augmented to a barge stage, and on the 10th to coal-boat water, which was maintained most of the remainder of the month. To add to the facility of navigation, only the opening and closing days of the month were attended by a light flow of ice, while the high water period was entirely free from it. As a consequence, the coal, iron, and other products loaded into boats at this point were promptly shipped to lower river ports. A natural result of the continued high water, although other conditions were favorable, was to practically close operations on river construction work during the latter two-thirds of the month. While the water reached fairly high stages on several occasions, the danger line was not exceeded in the vicinity of Pittsburg, and practically no damage was sustained by manufacturing and other interests here. The low temperatures prevailing at the end of the month caused a rapid drop in the stages on all the rivers in this vicinity, accompanied by a heavy flow of ice, which promises to quickly close the streams should it continue for a few days longer.

During the first six days of the month the river at Parkersburg fell slowly, reaching a stage of 8 feet. This was the lowest water of the month. Cold weather prevailed until the 6th and most of the smaller rivers of West Virginia were closed by ice. At Parkersburg ice began running on the 2d, and by the morning of the 3d towboats and small

packets were compelled to tie up, but were, however, released on the next day. The Little Kanawha was frozen over on the morning of the 5th, but the ice was thin and easily broken. Floating ice continued until the 8th, but the river was practically free after the 7th.

After the low water of the early part of the month all the rivers were filled by the general and moderately heavy rains which were of frequent occurrence after the 10th. At Parkersburg the crest of the first high water passed on the 16th with a stage of 30.2 feet. From that date until the 22d the river fell slowly. Moderately heavy rains on the 22d brought the second rise of the month and a stage of 31 feet was reached on the 26th, after which the river fell rapidly to a stage of 15.5 feet on the 31st. Excepting the first few days when floating ice impeded navigation, the river conditions during the month were unusually favorable for this period of the year.

The latter part of January, 1898, goes on record as a period of notably high water in the Ohio River at Cincinnati. The major portion of the several successive rises was chiefly due to the tremendous outpour of the streams that empty into the Ohio within a few miles of the gauge at Cincinnati. Previous January stages exceeding 50 feet on the Cincinnati gauge have occurred in 1862, 1870, 1876, and 1877.

In view of the continued rainy weather and the possibility of the rise in the Ohio becoming dangerous, river interests and business men in the bottoms, taught by experience, were, on the 14th, when the river had reached 38 feet, beginning to prepare for prompt action in case of emergency. On Sunday, the 16th, the river continued steadily rising throughout its length. A warning was telegraphed to Point Pleasant that it would pass the danger line (36 feet) at that point, and warnings were issued that the stage would pass the danger line (45 feet) at Cincinnati Sunday night. The danger line was passed at Point Pleasant on the 17th. At Cincinnati, however, the rise only reached 44.6 feet by midnight of the 17th, after which it had a falling tendency, the local freshets having run out. Another southwestern storm caused steady and heavy rains on the 19th over the territory drained by the local streams, which resulted in another sudden and somewhat alarming rise at this point. The first rush of water from the local tributaries caused a rise in the Ohio of 6 inches per hour. This was the more remarkable because of the already high stage and the fact that the bottom lands along the mouths of the tributaries were already submerged by backwater. The danger line was passed at midnight of the 19th. This rise was a purely local one, attributable mainly to the Little Miami River, above the mouth of which tributary the Ohio was falling. The local river forecast was issued that the stage would not exceed 50 feet; the highest gauge reading was 48.4 feet. There was, so far, very little interruption of business in the bottoms. Portions of some of the railroads were submerged, but there was no delay in train service.

The distinctive feature of this high water at Cincinnati is that it was essentially a local affair and that the Little Miami River was the chief contributor. But for the concentration of several successive heavy rains in this vicinity, piling up a tremendous mass of water in front of Cincinnati, the storms of the month would hardly have swollen the river at this point much, if any, above the danger line. There was some falling off in the general business, due to merchants apprehending higher water and to the bad condition of country roads. With the steady recession of the river, a prime factor in the trade of Cincinnati, business is again expanding and the improvement was emphasized by the more seasonable weather during the closing days of the month. Although reaching the unusual stage of 52.2 feet on the gauge, submerging the valleys and lowlands in the vicinity, lapping, as it were, the very doorsteps of the city, and causing much inconvenience and incidental expense in the way of removing goods, and a temporary shutdown of work, the high water of January did not interfere with the regular operations of the railroads or river interests.

The river at Louisville was lowest on the 3d, with 6.8 feet in the canal, which was a good boating stage. It rose steadily from the 7th to the 26th, reaching the highest stage for the month, 29.8 feet, on the latter date. The amount of rainfall for the month was greatly in excess of the normal, 9.04 inches being recorded at this station. The rainfall on the 19th and 20th and again on the 23d was especially heavy, so that the moderate flood stage the river reached at this point was generally expected. The danger line, 24 feet, was passed during the evening of the 20th. Gales on the 20th, 22d, 23d, and 25th, in conjunction with the high water, caused considerable damage to shipping in this vicinity. The wind reached a velocity of 43 miles on the 20th, 52 miles on the 22d, and 53 miles of the 25th. On the afternoon of the 25th the river was rougher than was ever known, and nearly all navigation was temporarily suspended.

The fall which was in progress at the close of December continued at Evansville until the 5th, and at Paducah and Cairo until the 8th. A very slight rise commenced at Evansville by the morning of the 6th, reached Paducah by the morning of the 9th, and started the river up at Cairo by the morning of the 10th. Before this water had drained off, a second and more pronounced rise, caused by heavy rains in the Ohio watershed, started in on the 10th, and this, together with subsequent rises in the Ohio, and occasional rises out of the Cumberland and Tennessee, kept the lower Ohio at a rising stage during the remainder of the month. At Evansville the river rose steadily from the 5th to the 28th, reached the danger line at 7 p. m. on the 15th, and at-

tained its maximum stage, 43.1 feet, on the morning of the 28th; it then commenced to fall and continued falling to the close of the month. On the morning of the 17th, at a stage of 33.4 feet, low bottom lands in the vicinity of Evansville were reported invaded by water, causing some families to move to higher ground. On the 24th, at a stage of 41.7 feet, many families living on bottom lands were driven from their homes and sought shelter in the city. Aside from the inconvenience caused these people no material damage to property resulted from the high water at Evansville. The Louisville Packet Company was obliged to tie up its steamers on the 27th on account of high water and difficulty in making landings, but resumed running on the 31st.

At Paducah, the rise starting in on the 9th continued until the morning of the 30th, when the maximum stage, 43.8 feet, was attained. The river reached the danger line on the morning of the 23d. No material damage nor inconvenience was caused by the high water at this point. All the low bottom lands in the vicinity of Paducah, both on the Ohio and Tennessee rivers, were submerged to a depth of 5 to 7 feet, but so far as at present ascertained no damage to property resulted.

At Cairo the danger line was reached on the 23d, and the maximum stage, 44.4 feet, on the morning of the 31st. The river came to a stand on the latter date, with conditions favorable for an early and rapid fall. The sewer outlets of the city were closed on or about the 17th, since which time the lowest places about the city have been gradually filling with waste and rain water. There is no likelihood, however, of the water confined within the levees reaching such a height as to cause any inconvenience. On the 17th a large boom containing about 2,700 logs belonging to the plant of the Chicago Mill and Lumber Company, located at this point, broke loose and drifted down the river.

Tennessee and Cumberland Rivers. (Reported by L. M. Pindell, Chattanooga, Tenn., and H. C. Bate, Nashville, Tenn.)—From the 12th a splendid boating tide prevailed in the Tennessee, causing at all river stations considerable business along the water fronts. About 2,500,000 feet of lumber arrived at Chattanooga in rafts from the Clinch River during the last two days of the month, consigned to various saw mills and manufacturing companies; more logs would have arrived but the log tides did not extend to the headwaters. Then, again, the mill men complain of several milldams across the Clinch River which obstruct the river and prevent the rafts from passing over. The rainfall of the month was evenly distributed and amounted to more than 8 inches at Kingston and Riverton. A general snowstorm prevailed over the watershed above Chattanooga on the 30th.

The month opened with the Cumberland River open as far up as Celina, but a steady fall shut off navigation above Nashville on the 5th. Heavy and general rains on the 10th and 11th caused a rapid rise, and good rain at intervals during the balance of the month kept the river open to the head of navigation. The river reached its maximum from the 23d to the 25th, and was the highest January river in many years; much damage resulted from the overflow. The river began falling at Burnside on the 23d. The month closed with good water below Celina, but above that point the river was falling rapidly and promised a close navigation in the upper divisions early in February.

Mississippi River and minor branches. (Reported by P. F. Lyons, St. Paul, Minn.; M. J. Wright, Jr., La Crosse, Wis.; G. E. Hunt, Davenport, Iowa; F. Z. Gosewisch, Keokuk, Iowa; H. C. Frankenfield, St. Louis, Mo.; P. H. Smyth, Cairo, Ill.; S. C. Emery, Memphis, Tenn.; R. J. Hyatt, Vicksburg, Miss.; and R. E. Kerkam, New Orleans, La.)—The rivers of Minnesota remained frozen over during all the month, and gauge readings could not be made at St. Paul, but an estimate of the stage of water in the Mississippi River was made from time to time, from which it was concluded that the highest and lowest gauge readings at St. Paul, if they could have been made, would have been 3.6 feet on the 4th, and 2.8 feet on the 22d. The ice in the river at this place attained a thickness at from 16 to 20 inches, which is greater than would be expected considering the mildness of the winter so far, but the almost total absence of snow no doubt accounts for it. Only a limited quantity of ice was harvested from the river, and that only for cold storage and like purposes. Ice harvested from lakes in this vicinity was from 1 to 2 inches thicker than that from the river.

In the vicinity of La Crosse the Mississippi River remained frozen during the entire month. During the early part of the month the ice in some places became weakened by the falling of the water and the high temperature, and on the 2d a Minnesota farmer broke through the ice near the Wisconsin shore while crossing with a load of wood. On the 19th the channel of Black River was open for some distance from its mouth. Good sleighing and mild weather prevailed, and a large variety of country produce was brought into market, many farmers coming from down-river points on the ice road. Considerable activity prevailed in nearly all branches of business as a result of favorable weather. The ice harvest progressed rapidly and satisfactorily during the month, some dealers having completed their harvest; others have their stock stored away for the summer and are now cutting ice for contracts.

The Mississippi at Dubuque has been entirely frozen over during the month of January, the ice ranging in thickness from 13 inches during the first two weeks to 16 inches at the close. The ice harvest at this

place has been on an extensive scale, authorities reporting about 55,000 tons gathered. Between 600 and 700 men were employed in this work.

At Davenport the ice ranged from 10 to 12 inches in thickness throughout the month, and an abundant amount was stored by ice-men for summer use. At the lower end of the city the ice was somewhat thicker and the Crescent Bridge Company, which is engaged in the construction of a railroad bridge at that point, transported stone and other material across the ice. The month closed with about 14 inches of snow on the ground, which may cause a moderate rise in the river if it goes off rapidly.

The river was closed at Keokuk, with ice averaging 12 inches, until the 16th. During the afternoon of the 16th the current on the rapids loosened the ice, which moved down, swelling the river to a stage of 9 feet at Keokuk. The movement of ice continued at intervals during the 17th, packing on the Iowa shore and crushing heavy timbers in the northern draw rest and ice breaks of the Keokuk and Hamilton bridge. During the night of the 17th the channel opened south, with heavy shore ice still holding. The shore ice was broken up by wind during the storm of the 22d, filling the channel with heavy floating ice, which formed a gorge south of the station during the 23d, and the river closed again during the night of the 23d, remaining closed at the end of the month, with ice averaging 11 inches in thickness.

The first day of January, 1898, saw the Mississippi practically blocked as far south as the mouth of the Missouri River, but on the 3d, owing to the warm weather, a gradual loosening and thawing commenced. This progressed steadily, and on the 7th ice cutting was suspended at Burlington, the ice being too soft for commercial purposes. The gorges below Burlington broke as follows: At Alton on the 11th, Grafton on the 9th, Louisiana on the 11th, and Quincy on the 18th. The cold of the 16th terminated the thaw, and on the 17th the river was once more practically closed from Canton northward, remaining so at the end of the month. Ice cutting at Burlington was resumed on the 17th and teams were once more crossing on the ice. Below the mouth of the Missouri River the ice continued to run until about the 12th, when it ceased. On the 28th it again commenced to run from Canton to Hannibal, reaching Louisiana on the 30th and St. Louis on the 31st. About the middle of the month the steamer *Eileen* came out of the Illinois River, bringing a cargo of grain to St. Louis. This was the only boat to reach St. Louis from the north. Southward navigation continued uninterruptedly during the entire month. On the Illinois River the ice broke at Beardstown on the 12th and ran out at Grafton the same day.

From Cairo to Helena during the first ten days of the month, there was a steady fall of a little over one-half foot per day, but this was checked at Cairo on the 10th, Memphis on the 11th, and Helena on the 13th, by a sudden rise coming out of the Ohio and Cumberland rivers and due to heavy rains over the entire region drained by these streams. At first the rise was only moderate, but as soon as the numerous small streams began to empty into the main tributaries, it increased rapidly, and for several days the water came up at the rate of 2 or 3 feet every twenty-four hours. During the eleven days ending January 22 the amount added to the Memphis stage was 22.5 feet, while at Cairo and Helena the increase was over 27 feet, which was more than double the rise that occurred during any corresponding period of the 1897 overflow.

At Memphis the entire rise for the month amounted to 27.9 feet, the highest stage being 33.2 feet, which was reached on the 31st. The rainfall was excessive during this period all over the lower Mississippi and Ohio valleys, and in the latter section melting snow aided in swelling the flood. The rainfall at Memphis between the 11th and 23d was over 9 inches, or about 44 inches more than the normal fall for the whole month of January. On the 26th the river began to go over its banks, and by the 27th it had spread through the woods for a considerable distance on the Arkansas side, and the ferry steamer *Organ* had begun to make trips to Marion, Ark., which is 12 miles inland. At that time there was water enough in the Tennessee Chute to admit of boats passing through, and some small ones did so, instead of following the main river around the island. The river getting over its banks caused a decided decrease in the rise, and by the end of the month the river was nearly stationary.

One noteworthy fact in connection with the present rise is that the flood stage at Memphis approached about three feet nearer to the Cairo reading than ever before. This was probably due to the excessive rains in this vicinity, which caused a rapid swelling of the small streams emptying into the Mississippi between Memphis and Cairo, chief of which are the Forked Deer, Obion, Wolf, and Hatchie. These streams drain a considerable area, and together they furnish a vast amount of water which was measured on the Memphis gauge.

There are but two instances on record of a higher stage in this section during January, and those were in 1882 and 1890. The 1882 rise was the most remarkable in point of duration. It began during the latter part of December and continued for about four months. At Memphis, that year, the river reached a 34-foot stage on January 29, and remained at or above 34 feet during February. In March it reached 35 feet, but fell to 32 feet by the end of that month, though it did not fall to 30 feet until April 10. It was in flood from January 25 to March 30, a period of sixty-five days. The rainfall for the first three months of

1882 amounted to 31.89 inches, or 15.23 inches above the normal for those months. The flood of 1890 also began in January; the river fell slightly during February, and then was in flood again during March and up to April 19. The conditions at the close of January, 1898, are favorable for an early decline of the flood. The low lands along the river are generally covered, but no great damage has so far resulted, and all railway trains are running as usual.

The Mississippi and its tributaries between Memphis and Vicksburg were rather low the first part of the month, but a rise reached this section about the middle of the month and from that time a rapid and decided rise was maintained to the end of the month. Good rains over the country drained by the White and Yazoo produced rises in those streams ample for all river traffic. Steamboats are now running on good time and river business is about all that could be desired. Some interruption was caused to river trade at Vicksburg the first of the month, due to the impassable condition of the road to the lower landing at Kleinston, where boats are compelled to land during low water. The rise in the river the latter part of the month, however, allowed boats to land at the city front, and the wharf boat was moved up to the city landing. Considerable anxiety was caused by the unfinished condition of the levees along the Mississippi, where crevasses occurred last year, in view of the impending rise in the river.

The Mississippi below Vicksburg was at a low but navigable stage during the first half of the month, after which a rapid rise occurred to the close of the month. The January rise was one of the most rapid in recent years, Vicksburg's rise being 30 feet and New Orleans' about 9 feet.

Missouri River. (Reported by L. A. Welsh, Omaha, Nebr.; P. Connor, Kansas City, Mo.; and H. C. Frankenfield, St. Louis, Mo.)—From a point considerably below Atchison, Kans., to the headwaters of the Missouri, the river remained frozen throughout the entire month. An average thickness of ice of about 8 inches was maintained at Omaha, increasing to 10 inches farther up the river. Remarkably mild weather, with but very little precipitation, prevailed throughout the Missouri watershed during the first and second decades, and especially in the upper Missouri valley region. Indicative of the unusually mild conditions, the *Huron Press* (S. Dak.) reports that on the 22d a party of young people from that city went 3 miles up the James River and enjoyed a picnic, dining in the open air, and playing open-air games as if it had been June instead of January. On the 19th it was reported from Vermilion, S. Dak., that the ice in the upper Missouri and Vermilion rivers did not exceed a thickness of 8 inches, and that with the continuation of mild weather the ice would soon be running; no ice houses had been filled, and building had been carried on all winter with hardly a day too cold for outside work. The cold wave on the night of the 24th and 25th, which extended over the upper valleys, materially changed the conditions, and more seasonable weather prevailed the remainder of the month.

The variations in the stage of the river at Kansas City have been very slight during the month, being between the stages of 4.8 and 5.4 feet. There was more or less floating ice each day except from the 16th to the 22d, when the river was clear.

The tendency of the lower Missouri was toward a somewhat higher stage, and, except at the mouth of the river, ice was not present in any great quantities. To the rather abundant rainfall and to the prevailing high temperatures these conditions may be attributed. Floating ice was noticed east of Kansas City until the 6th, when it ceased. It was again observed at Boonville from the 15th to the 18th and from the 24th to the 31st, but disappeared before reaching Hermann.

The gorge at the mouth of the river broke on the 11th and the ice rapidly disappeared down the Mississippi. The breaking of this gorge allowed the little steamer *Laura* to come out of the river and proceed to St. Louis. This steamer had been blocked by the ice during the cold weather of December at Port Royal, Mo., 60 miles above St. Louis, while endeavoring to make her way south to the Ouachita River to engage in winter trade. During the latter part of the month it was reported that the river at Sibley, Mo., was fast cutting into the north bank just above the Santa Fe Railroad bridge. The railroad company hastily began the work of repairs to prevent farther encroachments, and was evidently successful, for no news of farther cutting has been received. On January 1 readings of the new river gauge at Hermann, Mo., were commenced. The new gauge is located about 95 yards west of the old one, and its zero is set 3 feet lower, being at low water mark of December 21-22, 1878. This zero is 68.2 feet above the St. Louis directrix, and 480.9 feet above mean sea level. The new gauge is a substantial structure, and is well out of the way of the boats which so often proved a source of disaster to the old gauge.

Arkansas River. (Reported by J. J. O'Donnell, Fort Smith, Ark., and F. H. Clarke, Little Rock, Ark.)—The upper Arkansas River remained low and falling until the 13th, when a rise of 0.1 foot was indicated at Fort Smith. The rain of 11th to 15th caused a rise of 3 to 3.5 feet on the 17th in the Canadian, Grand, and Verdigris rivers; this effected a navigable stage in the Arkansas River at Fort Smith the afternoon of 19th, which continued until the end of the month. As the rise was anticipated the river steamers had cargoes shipped ready to take advantage of it westward to Webbers Falls, and the first trip was made since the second week in August.

The Arkansas River west of Little Rock continued too low for navigation during the first fifteen days of the month, but general rains over southern Kansas, Oklahoma and Indian Territories, and Arkansas on the 11th caused a decided rise of over one foot that was felt from Fort Smith to Little Rock on the 15th. The lower river continued rising to the 18th. Frequent rains during the last two weeks of the month caused slight fluctuations in the depth of the river, but a profitable boating stage was maintained uninterrupted from Fort Smith to the mouth during the last sixteen days of the month. The river from Little Rock to the mouth was navigable throughout the month and was free of ice and drift perilous to navigation.

Red River. (Reported by C. Davis, Shreveport, La., and R. E. Kerkam, New Orleans, La.)—A stage of water too low for navigation, except for the lightest craft, continued in the Red until the middle of the month, when the lower river rose to a navigable stage. The development of an exceptionally large number of storms in the Southwest, and their progression northeastward induced heavy rains in the watershed at intervals. The increased stages, consequent upon this increment of moisture, gave new life to the river interests, which, on account of low water, had languished since August, 1897.

There was a navigable stage in the Ouachita after the first week of the month, the river rising rapidly at Camden after the 5th and at Monroe after the 8th; the rise at Camden continued until the 25th, and at Monroe until the closing days of the month, and the total rise ranged from 25 to 28 feet.

Heights of rivers above zeros of gauges, January, 1898.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
<i>Mississippi River.</i>	<i>Miles</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>
St. Paul, Minn. †	1,957	14						
Reeds Landing, Minn. †	1,887	12						
La Crosse, Wis. †	1,822	10						
North McGregor, Iowa.	1,762	18						
Dubuque, Iowa †	1,702	15						
Leclaire, Iowa †	1,612	10						
Davenport, Iowa †	1,596	15						
Keokuk, Iowa †	1,466	14						
Hannibal, Mo.	1,405	17	2.9			31	2.0	2.0
Grafton, Ill.	1,307	23	5.9			3	4.7	2.0
St. Louis, Mo.	1,264	30	7.7			4	5.0	6.1
Chester, Ill.	1,189	30	5.8			1	3.5	5.4
Cairo, Ill.	1,073	40	44.4			8.9	26.7	14.9
Memphis, Tenn.	843	33	33.2			11	19.0	27.9
Helena, Ark.	767	44	41.8			11, 12	23.0	33.8
Arkansas City, Ark.	635	42	40.5			13	22.3	31.3
Greenville, Miss.	595	40	34.7			13	18.2	27.5
Vicksburg, Miss.	474	41	39.2			1	19.3	31.3
New Orleans, La.	108	16	12.6			3	6.1	9.8
<i>Arkansas River.</i>								
Wichita, Kans.	720	10	1.7	13, 18	0.6	5-11	1.1	1.1
Fort Smith, Ark.	345	42	7.7	21	1.0	11, 12	3.3	6.7
Dardanelle, Ark.	250	21	7.2	23	0.2	12	2.8	7.0
Little Rock, Ark.	170	23	10.1	24	2.9	5	6.2	7.2
<i>White River.</i>								
Newport, Ark.	150	26	14.2	24, 25	2.1	10	7.5	12.1
<i>Des Moines River.</i>								
Des Moines, Iowa †	150	19						
<i>Illinois River.</i>								
Peoria, Ill.	135	14	7.7	31	4.0	8, 10, 11	5.4	3.7
<i>Missouri River.</i>								
Bismarck, N. Dak. †	1,201	14						
Pierre, S. Dak. †	1,006	14						
Sioux City, Iowa †	676	19						
Omaha, Nebr. †	561	18						
St. Joseph, Mo.	373	10						
Kansas City, Mo.	280	21	5.4	5, 7, 26, 27	4.8	18	5.1	0.6
Boonville, Mo.	191	20	5.6	27	3.2	2	4.2	2.4
Hermann, Mo.	95	21	5.8	27	2.2	4, 7	3.9	3.6
<i>Ohio River.</i>								
Pittsburg, Pa.	966	22	19.7	24	3.4	5, 6	10.8	16.3
Davis Island Dam, Pa.	960	25	18.0	24	5.4	5	11.2	12.6
Wheeling, W. Va.	875	36	27.5	25	6.3	2	16.4	21.2
Parkersburg, W. Va.	785	35	31.0	26	8.0	6	30.3	20.0
Point Pleasant, W. Va.	703	36	37.0	26, 27	7.5	4	24.1	29.9
Cattlettsburg, Ky.	651	50	43.5	27	10.1	5	28.6	33.4
Portsmouth, Ohio.	612	50	46.8	27	10.9	1	30.9	35.9
Cincinnati, Ohio.	499	45	52.2	26	13.8	1, 2	35.3	38.4
Louisville, Ky.	367	24	29.8	26, 27	6.8	3	17.4	23.0
Evansville, Ind.	184	30	43.1	28	10.0	5	28.1	33.1
Paducah, Ky.	47	40	43.8	30, 31	7.6	8	25.5	36.2
<i>Alleghany River.</i>								
Warren, Pa.	177	7	8.3	14	1.4	1, 9, 10	4.0	6.9
Oil City, Pa.	123	13	10.0	14	2.0	11, 12	4.6	8.0
Parkers Landing, Pa.	73	20	11.0	14	1.7	1	6.6	9.3
Freeport, Pa.	26	20	18.0	14	3.5	3, 4	10.0	14.5
<i>Conemaugh River.</i>								
Johnstown, Pa.	64	7	6.8	26	1.4	4-6	3.5	5.4
<i>Red Bank Creek.</i>								
Brookville, Pa.	35	8	5.3	13	0.8	3-12	1.7	4.5
<i>Beaver River.</i>								
Ellwood Junction, Pa.	10	14	5.1	23	1.0	4-6, 19	2.4	4.1
<i>Cumberland River.</i>								
Burnside, Ky.	434	50	32.6	23	2.1	4	12.8	30.5
Carthage, Tenn.	257	30	34.1	25	2.6	5, 6	18.2	31.5
Nashville, Tenn.	175	40	38.8	23	4.0	6, 7	23.1	34.8
<i>Great Kanawha River.</i>								
Charleston, W. Va.	61	30	13.1	11	3.8	5	7.1	9.3
<i>New River.</i>								
Hinton, W. Va.	95	14	5.0	16	1.1	3, 4	2.8	3.2

Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger-line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
<i>Licking River.</i>	<i>Miles.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>
Falmouth, Ky.....	30	25	27.5	23	3.0	3-5, 31	9.5	24.5
<i>Miami River.</i>								
Dayton, Ohio.....	69	18	9.4	21, 23	1.4	6	4.2	8.0
<i>Monongahela River.</i>								
Weston, W. Va.....	161	18	10.9	10	0.0	19, 22	2.7	10.9
Fairmont, W. Va.....	119	25	14.1	11	2.7	30	5.9	11.4
Greensboro, Pa.....	81	18	17.4	11	8.2	6	11.4	9.2
Lock No. 4, Pa.....	40	28	23.9	11	8.6	5	13.7	13.3
<i>Cheat River.</i>								
Rowlesburg, W. Va.....	36	14	8.5	10	3.0	1-7	4.6	5.1
<i>Youghiogheny River.</i>								
Confluence, Pa.....	59	10	7.0	13	1.9	6	4.0	5.5
West Newton, Pa.....	15	23	8.0	16, 24	1.3	3	4.7	6.7
<i>Muskingum River.</i>								
Zanesville, Ohio.....	70	20	22.4	24	6.5	4	13.8	15.9
<i>Tennessee River.</i>								
Knoxville, Tenn.....	614	29	8.9	27	0.7	6	4.0	8.2
Kingston, Tenn.....	534	25	10.1	27	0.6	6	5.2	9.5
Chattanooga, Tenn.....	430	33	18.2	27	2.6	6	9.1	15.6
Bridgeport, Ala.....	390	24	14.8	28	1.3	6-8	7.2	13.5
Florence, Ala.....	220	16	13.8	29	1.4	10	7.8	12.4
Johnsonville, Tenn.....	94	21	29.1	24	3.1	10, 11	15.5	26.0
<i>Clinch River.</i>								
Spears Ferry, Va.....	156	20	5.2	26	0.2	3, 4	1.7	5.0
Clinton, Tenn.....	46	25	14.5	27	3.4	6	8.9	11.1
<i>Wabash River.</i>								
Mount Carmel, Ill.....	50	15	21.8	31	2.6	3	12.9	19.2
<i>Red River.</i>								
Arthur City, Tex.....	688	27						
Fulton, Ark.....	565	28	13.8	24	2.5	11	6.6	11.3
Shreveport, La.....	449	29	12.0	27-29	1.2	8-13	5.6	10.8
Alexandria, La.....	139	33	19.0	25	1.8	12	8.2	17.2
<i>Atchafalaya Bayou.</i>								
Melville, La.....	100*	31	30.3	31	14.3	1, 14	10.9	16.0
<i>Ouachita River.</i>								
Camden, Ark.....	340	39	33.7	25	6.0	5	22.4	27.7
Monroe, La.....	100	40	33.8	31	9.1	8	13.8	24.7
<i>Yazoo River.</i>								
Yazoo City, Miss.....	80	25	21.7	31	5.2	14	13.0	16.5
<i>Chattahoochee River.</i>								
Columbus, Ga.....	140	20	6.3	29	0.7	12, 13	1.9	5.6
<i>Flint River.</i>								
Albany, Ga.....	80	20	2.3	21-23, 27, 28	1.6	5-8, 17	2.0	0.7
<i>Cape Fear River.</i>								
Fayetteville, N. C.....	100	38	14.0	27	3.3	12	4.8	10.7
<i>Columbia River.</i>								
Umatilla, Oreg.....	270	25	5.5	2	2.7	30	4.1	2.8
The Dalles, Oreg.....	166	40	9.0	1	2.7	31	5.5	6.3
<i>Willamette River.</i>								
Albany, Oreg.....	99	20	8.8	21	4.0	13, 14	5.7	4.8
Portland, Oreg.....	10	15	8.5	1	2.6	31	5.6	5.9
<i>Edisto River.</i>								
Edisto, S. C.....	75	6	3.8	1	2.9	20-24	3.2	0.9
<i>James River.</i>								
Lynchburg, Va.....	257	18	2.8	17	0.2	3	1.4	2.6
Richmond, Va.....	110	12	1.9	30	- 0.1	4-12	0.6	2.0
<i>Alabama River.</i>								
Montgomery, Ala.....	265	35	13.8	29, 30	0.9	10, 11	4.4	12.9
Selma, Ala.....	212	35	15.4	31	0.8	9, 12	4.9	14.6
<i>Coosa River.</i>								
Rome, Ga.....	225	30	14.6	27	1.3	7-10	4.4	13.3
Gadsden, Ala.....	144	18	15.4	28	0.7	7-10	4.6	14.7
<i>Tombigbee River.</i>								
Columbus, Miss.....	285	33	21.5	25	- 0.5	10	13.9	22.0
Demopolis, Ala.....	155	35	45.4	31	4.8	11	26.1	40.6
<i>Black Warrior River.</i>								
Tuscaloosa, Ala.....	90	38	43.5	27	4.0	10, 11	17.2	39.5
<i>Pedee River.</i>								
Cheraw, S. C.....	145	27	12.0	27	1.0	11	2.7	11.0
<i>Black River.</i>								
Kingstree, S. C.....	60	12	5.6	3	3.2	21-23	4.2	2.4
<i>Lumber River.</i>								
Fairbluff, N. C.....	10	6	2.1	31	0.6	19-22	1.3	1.5
<i>Lynch Creek.</i>								
Effingham, S. C.....	35	12	5.8	2	3.4	20, 21	4.1	2.4
<i>Potomac River.</i>								
Harpers Ferry, W. Va.....	170	16	7.5	24	1.3	10	3.6	6.2
<i>Roanoke River.</i>								
Clarksville, Va.....	155	12	0.3	26	0.1	1-24, 30, 31	0.1	0.2
<i>Sacramento River.</i>								
Redbluff, Cal.....	241	23	1.2	15	0.4	30, 31	0.8	0.8
Sacramento, Cal.....	70	25	10.7	8, 9	9.2	31	10.0	1.5
<i>Santee River.</i>								
St. Stephens, S. C.....	50	12	7.1	31	1.1	21, 22	2.9	6.0
<i>Congaree River.</i>								
Columbia, S. C.....	37	15	4.8	26	1.2	3-5	1.7	3.6
<i>Watauga River.</i>								
Camden, S. C.....	45	24	13.5	27	2.7	14	4.9	10.8
<i>Savannah River.</i>								
Augusta, Ga.....	130	32	16.7	27	5.9	7, 9	7.5	10.8
<i>Susquehanna River.</i>								
Wilkesbarre, Pa.....	178	14	17.9	16	2.0	2-13	5.2	15.9
Harrisburg, Pa.....	70	17	10.5	25	1.9	5, 6	5.2	8.6
<i>Juniata River.</i>								
Huntingdon, Pa.....	80	24	7.0	23	3.6	6, 7	4.7	3.4
<i>W. Br. of Susquehanna.</i>								
Williamsport, Pa.....	35	20	9.9	24	1.7	3, 4	4.9	8.2
<i>Waccamaw River.</i>								
Conway, S. C.....	40	7	2.1	1, 31				

* Distance to Gulf of Mexico. † Frozen entire month. * Frozen, 5. † Frozen, 3-12.
* Frozen, 4-6. † Record for 27 days. * Record for 23 days.

SPECIAL CONTRIBUTIONS.

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(Dated March 7, 1898.)

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CLIMATOLOGICAL DATA FOR JAMAICA, W. I.

Through the kindness of Mr. Maxwell Hall, of Montego Bay, Jamaica, the meteorological service of that colony has acceded to the request of the Editor for the prompt communication of an abstract of the very interesting climatological records of that highly important West Indian service. The climatological summary for January, 1898, furnished by Mr. Hall, through his assistant, Mr. Robert Johnstone, of the Meteorological Office, is reproduced in the following table. For descriptive details of the stations and instruments see Vol. XXV, pages 308 and 356.

Jamaica, W. I., climatological data, January, 1898.

	Morant Point Lighthouse.	Negril Point Lighthouse.	Kingston.	Montego Bay.	Castleton Gar- dens.	Hope Gardens.	Stony Hill Re- formatory.	Hill Gardens (Cln. Plant.)
Latitude	17° 56'	18° 16'	17° 58'	18° 12'	18° 12'	18° 05'	18° 05'	18° 05'
Longitude	76° 19'	76° 23'	76° 48'	76° 50'	76° 50'	76° 39'	76° 39'	76° 39'
Elevation (feet)	8	33	50	580	600	1,400	4,907	4,907
Mean barometer { 7 a. m.	29.988	30.003	30.003	29.999	29.641	29.37	29.378	29.378
{ 3 p. m.	29.940	29.941	29.926	29.938	29.609	29.28	29.361	29.361
Mean temperature { 7 a. m.	77.6	71.2	69.2	68.7	65.7	65.6	66.3	57.1
{ 3 p. m.	80.8	82.1	84.1	80.1	78.2	82.3	77.7	64.1
Mean of maxima	84.0	86.8	81.7	84.8	87.7	82.7	82.7	67.4
Mean of minima	68.2	68.1	67.3	60.4	63.2	63.1	53.1	53.1
Highest maximum	87	83.5	85.0	85	92	86	73	73
Lowest minimum	63	63.4	63.1	55	59	54	46	46
Mean dew-point { 7 a. m.	65.8	62.7	65.0	64.8	62.1	63.9	51.7	51.7
{ 3 p. m.	69.4	66.6	68.0	70.0	69.7	72.0	58.6	58.6
Mean relative humidity { 7 a. m.	83	80	88	88	90	92	80	80
{ 3 p. m.	66	67	67	73	67	83	82	82
Monthly rainfall (inches)	1.92	0.89	0.03	0.14	4.67	0.92	0.40	3.04
Average daily wind movement	275.2	56.8	94.0	.....	.....	.....	46.9	.....
Average wind direction { 7 a. m.	ne.	var.	n.	ene.	.....	.....	80.	.....
{ 3 p. m.	9.0	12.6	3.1	2.5	.....	.....	8.	.....
Average hourly velocity { 7 a. m.	11.0	13.3	5.3	6.3	.....	.....	.....	.....
{ 3 p. m. ....	.....	.....	.....	.....	.....	.....	.....	.....
Average cloudiness (tenths):								
7 a. m. { Lower clouds	2.6	1.5	0.9	2.1	.....	.....	.....	.....
{ Middle clouds	2.0	1.1	0.2	0.3	.....	.....	.....	.....
{ Upper clouds	0.9	1.8	0.8	1.0	.....	.....	.....	.....
3 p. m. { Lower clouds	3.5	3.4	2.3	0.4	.....	.....	.....	.....
{ Middle clouds	1.5	2.0	1.1	1.4	.....	.....	.....	.....
{ Upper clouds	0.7	0.8	1.6	0.7	.....	.....	.....	.....

*ne. by n. †se. by s.

OBSERVATIONS AT HONOLULU, REPUBLIC OF HAWAII.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, a copy of the daily record at Honolulu is communicated to the Weather Bureau in advance of its official publication, and is herewith printed, as a special contribution, for the convenience of those who are studying the relations of the storms and weather of the United States to those of adjacent countries, with a view to long-range, seasonal predictions.

Meteorological observations at Honolulu, Republic of Hawaii, by Curtis J. Lyons, Meteorologist to the Government Survey.

Pressure is corrected for temperature and reduced to sea level, but the gravity correction, -0.06, is still to be applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 10. Two directions of wind, or values of wind force, connected by a dash, indicate change from one to the other. The rainfall for twenty-four hours is given as measured at 6 a. m. on the respective dates.

JULY, 1897.

July, 1897.	Pressure at sea level.			Temperature.				Relative humidity.			Wind.		Cloudiness.	Rain measured at 6 a. m.
	6 a. m.	8 p. m.	9 p. m.	6 a. m.	8 p. m.	9 p. m.	Maximum.	Minimum.	6 a. m.	8 p. m.	9 p. m.	Direction.	Force.	
1.	Ins.	Ins.	Ins.	o	o	o	o	o	%	%	%	ene.	2	Ins.
2.	30.01	29.96	30.00	70	78	72	81	67	82	67	86	sw.	2	0.00
3.	30.06	29.99	30.00	70	75	70	81	68	81	68	81	sw.	1	0.00
4.	30.11	30.03	30.11	68	78	68	81	65	81	67	85	sw.	1	0.00
5.	30.13	30.05	30.13	70	80	72	82	67	86	68	81	sw.	1	0.01
6.	30.11	30.00	30.03	73	80	72	82	72	85	64	82	ene.	1	0.00
7.	30.07	30.00	30.08	69	78	74	81	68	81	67	82	ene.	1	0.00
8.	30.07	30.02	30.05	68	78	68	83	66	87	60	82	ene.	1	0.00
9.	30.07	29.96	30.06	65	78	68	81	64	75	75	90	sw.	1	0.00
10.	30.06	29.97	29.98	63	78	69	83	62	90	67	81	ene-sw.	2	0.00
11.	30.03	30.04	30.06	63	70	68	78	63	84	55	71	ene-sw.	2	0.00
12.	30.08	29.87	29.95	63	70	63	73	61	69	57	84	ene-sw.	3	0.01
13.	29.98	29.87	29.96	58	73	65	75	57	83	61	85	ene-sw.	3	0.01
14.	29.98	29.85	29.92	65	72	68	79	62	80	91	86	ene.	1	0.00
15.	29.91	29.90	29.96	67	70	70	75	66	95	81	76	ene.	1	0.00
16.	29.93	29.93	29.99	62	78	73	80	60	83	49	77	ene.	1	0.00
17.	29.96	29.97	30.03	67	73	73	78	65	71	62	69	ene.	3	0.00
18.	30.04	30.01	30.01	70	78	74	78	68	71	62	74	ene.	4	0.02
19.	30.06	30.03	30.10	73	77	73	78	68	77	63	74	ene.	3	0.01
20.	30.08	30.08	30.14	71	75	73	80	72	85	49	78	ene.	2	0.01
21.	30.10	30.10	30.17	71	76	73	79	69	88	62	65	ene.	3	0.02
22.	30.16	30.10	30.14	72	76	72	78	71	73	59	65	ene.	3	0.01
23.	30.17	30.08	30.13	71	75	72	78	71	73	59	77	ene.	3	0.00
24.	30.15	30.05	30.07	70	75	70	77	69	60	74	86	ene.	2	0.02
25.	30.11	30.09	30.10	69	75	70	77	65	67	78	81	ene.	1	0.02
26.	30.12	30.09	30.18	69	74	75	78	65	86	74	78	ene.	1	0.05
27.	30.13	30.19	30.21	66	74	68	76	63	71	56	58	ene.	5	0.15
28.	30.23	30.15	30.17	67	72	68	75	66	66	57	72	ene.	4	0.00
29.	30.24	30.11	30.20	68	72	69	75	67	63	61	61	ene.	2	0.00
30.	30.18	30.09	30.15	70	74	72	77	67	68	74	58	ene.	3	0.00
31.	30.12	30.09	30.15	70	74	72	77	67	68	74	58	ene.	3	0.00
Mean	30.08	30.02	30.07	67.7	75.3	71.1	78.8	65.8	74.1	65.8	44.4	ene.	2	0.84

Mean temperature: 6+2+9+3 is 71.4°; extreme temperatures, 83° and 57°.

JANUARY, 1898.

January, 1898.	Pressure at sea level.			Temperature.				Relative humidity.			Wind.		Cloudiness.	Rain measured at 6 a. m.
	6 a. m.	8 p. m.	9 p. m.	6 a. m.	8 p. m.	9 p. m.	Maximum.	Minimum.	6 a. m.	8 p. m.	9 p. m.	Direction.	Force.	
1.	Ins.	Ins.	Ins.	o	o	o	o	o	%	%	%	ene.	1	0.01
2.	30.16	30.10	30.14	71	74	70	78	69	68	78	81	ene.	1	0.10
3.	30.17	30.10	30.15	69	75	72	79	66	90	62	73	ene.	2	0.10
4.	30.14	30.09	30.14	67	73	71	76	66	71	82	77	ene.	2	0.02
5.	30.15	30.10	30.18	67	72	62	74	66	85	73	81	ene.	3-4	1.01
6.	30.16	30.06	30.15	66	70	70	79	65	85	73	72	ene.	4	1.21
7.	30.17	30.08	30.12	67	69	70	74	65	85	90	81	ene.	3	0.91
8.	30.10	30.07	30.13	69	74	70	76	65	81	73	81	ene.	3	0.37
9.	30.12	30.11	30.19	64	72	70	74	63	90	77	68	ene.	3	1.42
10.	30.14	30.08	30.12	68	74	71	77	66	71	70	68	ene.	3	0.36
11.	30.11	30.05	30.10	69	72	72	76	67	72	77	73	ene.	3	0.09
12.	30.03	30.01	30.07	69	74	72	78	69	76	74	77	ene.	2	0.12
13.	30.08	30.00	30.07	68	77	69	79	69	76	67	81	ene.	1	0.12
14.	30.10	30.08	30.13	66	77	73	80	65	71	67	82	ene.	1	0.02
15.	30.11	30.07	30.14	71	77	72	78	70	72	71	77	ene.	2	0.00
16.	30.10	30.07	30.10	69	75	72	77	69	76	62	65	ene.	3-2	0.02
17.	30.07	30.04	30.11	70	72	72	78	70	72	78	77	ene.	1	0.00
18.	30.10	30.06	30.12	67	75	74	78	65	76	74	70	ene.	0-3	0.01
19.	30.11	30.04	30.10	70	73	72	77	70	68	82	69	ene.	3	0.03
20.	30.08	30.00	30.04	69	75	69	78	69	70	78	86	ene.	1	0.00
21.	30.02	29.97	30.04	67	76	73	80	66	80	78	82	ene.	1	0.29
22.	30.07	30.04	30.11	69	76	72	80	68	80	74	91	ene.	2	0.00
23.	30.12	30.07	30.14	70	76	72	80	70	81	74	77	ene.	3	0.01
24.	30.11	30.07	30.11	70	76	72	81	69	81	70	69	ene.	3	0.00
25.	30.10	30.05	30.09	69	75	71	78	69	76	78	77	ene.	3	0.00
26.	30.09	30.03	30.08	69	73	74	78	68	72	66	66	ene.	3	0.05
27.	30.09	30.04	30.13	70	74	71	81	79	81	71	86	ene.	1	0.00
28.	30.10	30.06	30.10	70	77	71	78	70	72	66	72	ene.	3	0.02
29.	30.07	30.01	30.07	70	75	70	77	70	68	61	68	ene.	3	0.00
30.	30.01	29.97	30.03	66	73	68	74	64	80	73	76	ene.	2	0.00
31.	29.97	29.94	30.02	66	72	68	74	64	71	72	76	ene.	1	0.08
Mean	29.94	29.81	29.93	67	71	69	77	66	80	70	90	ene.	1	0.04
Mean	30.09	30.04	30.08	68.4	74.0	71.0	77.5	67.4	76.7	72.9	76.4	ene.	2	6.26

Mean temperature: 6+2+9+3 is 71.1; extreme temperatures, 81° and 63°.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Mariano Bárcena, Director, and Señor José Zendejas, vice-director, of the Central Meteorologico-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the *Boletín Mensual*; an abstract translated into English measures is here given in continuation of the similar tables published in the MONTHLY WEATHER REVIEW during 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.

Mean temperature: 6+2+9+3 is 73.0; extreme temperatures, 83° and 59°.

Mexican data for January, 1898.

Stations.	Altitude.	Mean barometer.	Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
			Max.	Min.	Mean.			Wind.	Cloud.
Aguas Calientes.....	6,119	23.94	73.7	31.5	57.6	50	0.00	s.	w.
Arteaga (Coahuila)...	.....	.....	77.4	34.9	57.4	.....	0.00	.....	.....
Barousse (Coahuila)...	5,414	.....	80.2	34.9	58.5	.....	0.00	.....	.....
Colima (Sem.).....	.....	.....	.....	.....	73.9	.....	.....	.....	.....
Durango (Sem.).....	6,241	24.04	80.6	31.5	56.8	53	0.00	.....	w.
Leon.....	5,934	24.31	78.6	27.0	57.7	44	0.00	sw.	ne.
Magdalena (Sonora)...	4,948	.....	.....	.....	50.5	7.56	.....	ne.	ne.
Mazatlan (Cinaloa)...	35	29.98	78.1	56.3	67.3	75	0.00	nw.	sw.
Merida (Yucatan)...	50	30.05	85.4	51.4	75.2	63	0.26	ese.	se.
Mexico (Obs. Cent.)...	7,472	23.08	73.9	32.4	55.0	49	0.00	e.	s.
Morelia (Seminario)...	6,401	23.99	80.1	34.2	58.8	57	0.00	sw.	w.
Oaxaca.....	5,164	25.10	84.9	36.1	61.2	54	0.00	nw.	ne.
Puebla (Col. Cat.)...	7,112	23.96	74.5	36.1	56.3	54	0.00	ne.	.....
Paros (Coahuila)...	3,986	.....	76.6	38.5	66.6	T.	.....	.....	.....
Saltillo (Col. S. Juan)	5,399	24.84	79.2	38.4	61.0	46	0.00	s.	sw.
San Luis Potosi.....	6,362	24.16	73.8	38.4	56.8	56	0.00	sw.	w.
Silao (Guanaajuato)...	6,063	24.30	74.5	38.5	59.5	55	0.00	w.	w.
Torreón (Coahuila)...	3,730	.....	81.1	37.5	59.2	T.	.....	.....	.....
Vaqueria.....	.....	.....	78.3	29.3	61.5	.....	0.00	.....	.....
Zacatecas.....	5,015	22.52	78.8	38.4	55.6	55	0.00	sw.	w.
Zapotlan (Seminario)...	5,075	.....	84.4	39.0	63.0	53	0.00	ese.	sw

THE TORNADO OF JANUARY 12, AT FORT SMITH, ARK.

By J. J. O'DONNELL, Weather Bureau Observer.
(Dated February 21, 1898.)

From the very full notes on this tornado reported by Mr. O'Donnell, the Editor has made the following extracts:

On January 8, over the central Pacific Slope, an area of high pressure extended eastward over the southern Plateau and the Platte Valley to the Missouri River, southern Iowa, and Kansas. By the morning of the 10th a low area extended over the southern Pacific Slope, the Salt Lake, and Rio Grande valleys, and a secondary low prevailed in the neighborhood of Dodge City, Kans. The latter continued deepening, and on the morning of the 11th appeared as a storm center over southern New Mexico, inclosing the isotherms of 40 and 50, the path of movement of the center being about halfway between the inclosed isotherms. In the Northwest a low also appeared; there were thus two areas of low pressure with an intervening high. North and west winds with falling temperature prevailed on the west, but south and east winds with rising temperature on the east side, with cloudy weather and some rain. By 5 p. m. of the 11th the barometer had fallen 0.30 in front of the advancing storm center, but at Fort Smith the fall was only 0.12, and at Little Rock 0.10. The minimum at Oklahoma occurred at 5:30 p. m., and then rose until 8 p. m., but at this same time the barometer was falling rapidly at Fort Smith and at Little Rock. It is probable that the area of falling barometer either remained stationary or moved eastward, as Shreveport reports a maximum wind velocity of 36 miles at 7:55 p. m., whereas the maximum at Fort Smith, up to 8 p. m., was only 13 miles from the east. The change of wind at Oklahoma, from south to north, was probably contemporaneous with the rise in pressure, the beginning of the fall in temperature and the development of the thunderstorm. At this time, 6 p. m., the echelon movement of the clouds, with the bluish-green color, was first observed at Fort Smith; probably similar contemporaneous phenomena occurred elsewhere along the axis of the storm center. At 8 p. m. all stations in front and on the east of the storm's center or axis reported precipitation, and at many of them thunderstorms with maximum wind velocities of over 25 miles per hour, but at Fort Smith (and within 50 miles distance, so far as could be ascertained) no rain whatever had fallen. At South McAlester, Ind. T., on the Choctaw Railroad, 80 miles west-southwest of Fort Smith, rain began about 9 or 9:30 p. m., according to Judge Clayton, with lightning, which continued into the night; the air was then very sultry. About

11 p. m. the tornado cloud was observed in the air between Hartshorne and Alderson, Ind. T. (therefore 20 miles nearer Fort Smith), by persons who fled to their tornado cellars.

At Fort Smith, at 5:15 p. m., the cumulo-stratus clouds were moving rapidly from the south and southwest, mingling in the usual manner of such clouds, while the eastern horizon was obscured by stratus. Shortly after 6 p. m. these cumulo-stratus had changed somewhat in color, from dark gray to bluish-green, being inky black on the edges and but slightly mottled in the center. As the night approached the bluish-green became deeper, the inky spots became larger, the texture was more compact, the movement and direction remained the same, and there was no appearance of a funnel at that time.

At 8 p. m., while observing the clouds, the wind vane veered to the south with a jerk that almost wrenched it from its support, but immediately backed slowly to east and remained steady; the clouds were a sheet of unbroken stratus moving from the west, and seemingly lower than before.

At 9 p. m., when changing the thermograph sheet, the wind was still steady from the east; intense darkness prevailed in the west and north; some stars were to be seen in the east, showing that the sky in that quadrant was lightly obscured; not a trace of lightning anywhere.

At 9:35 p. m. the first lightning was observed, very low in the southwest horizon; it spread toward the south and the west, and by 10 p. m. reached an altitude of 50°.

At 11:10 p. m. the first thunder was heard, coming from the southwest; then, at intervals of six or seven minutes, it was repeated until the tornado struck the city. At no time was the lightning fierce nor the thunder loud; the lightning was always weak and distant, considering its quantity.

About 11:30 p. m. the lightning became more concentrated in the southwest, the flashes, radiating fan-shaped from a center in luminous beams, reaching to the zenith. Until midnight frequent sheet lightning illuminated the whole southern and western sky, exhibiting dense masses of broken cumulo-stratus clouds, meeting and uniting as they passed rapidly eastward.

As the clock was striking midnight and the office was about to be locked up, the barometer reading 28.846, actual, the wind south, not a drop of rain having fallen, the air feeling sultry and very damp, and while the book of mean pressures was being examined for comparative barometer readings, a gurgling noise was heard, like water rushing out of a bottle, followed immediately by a rumbling, such as that made by a number of heavy carriages rolling rapidly over a cobblestone pavement, and finally like a railroad train. These three noises appeared in this order of succession; each was distinctly different and clearly distinguishable from the other. This noise or roar is entirely peculiar to itself, though resembling those just mentioned, and is always recognizable as the "tornado roar." About two seconds elapsed between the first roar and the rattling and quivering of the office window by the wind and the terrific driving rain which at once forced itself in between the frame and the sash, at the top, the bottom, and the sides, and flooded the office. The book of means was laid aside and the observer went to the landing in the large skylight on the roof of the observatory, whence he saw the tornado cloud 450 feet distant to the southward, a twisted black mass of two clouds, accompanied by lightning from the upper parts of the clouds. The lightning was a continuous series of flashes of a pale yellow color; the noise of the thunder sounded like the muffled beating of a number of drums within the cloud. The clouds appeared like inverted siphons, each curved over downward from the right or left hand side of the cloud, respectively, to the center, where they came in contact with each other and twisted about one another downward to the ground, being narrowest about 40 feet from the ground and, probably, about 100 feet high.

The tornado cloud was seen emerging out of the National Cemetery and passing by the United States post office and the county courthouse. In its passage through the cemetery it uprooted forty trees, lifted the iron flagstaff, although embedded in solid granite, snapped to pieces the 1-inch wire cable guy of the staff, lifted bodily from its base 500 feet of 12-inch brick wall $4\frac{1}{2}$ feet high, and demolished the keeper's residence. In its passage through vacant property to the principal business street it passed over the residence of Mrs. Mivelaz, the brick walls of which burst outward with a loud explosion, undoubtedly due to the low air-pressure at the center of the tornado; a similar fate befell a frame building. Farther on, and on the left-hand side of the tornado track, a two-story stone building was demolished and a three-story brick building was carried entire 25 feet away from its foundation. Thirty-three persons were killed outright and nineteen subsequently died from their injuries; forty-four others were seriously injured.

As far as can be learned, the tornado descended to the ground first in the mountainous country near San Bois, in the Choctaw Nation, 100 miles southwest of Fort Smith; crossed the Arkansas River three times, viz, at the mouth of Cache Creek, at a point near Fort Smith, at a third point beyond Fort Smith, four miles east of Van Buren. At Belmont in the eastern part of Crawford County, 20 miles northeast of Fort Smith, it was observed ascending and disappearing in the air.

The passage of the tornado cloud was actually observed during about six seconds by the observer at Fort Smith, during which time it traveled about 700 feet, passing in front or south of his office at 12:08 or 12:09 a. m., at which time the extreme wind velocity was 60 miles from the southwest, while the maximum or average velocity during five minutes was 48 miles. The rainfall lasted four minutes, from 12:07 to 12:11 a. m., January 12, and amounted to 0.38, as found in the gauge. At 12:40 a. m. not a cloud remained visible in the sky except a bank of stratus in the western horizon. The directions in which the debris were thrown are given by Mr. O'Donnell in detail. Nearly everything within 300 yards of the central path was thrown from either side toward the center. The only movement that was not fre-

quently shown was from the northwest. The general trend of the central path was almost exactly from west to east, in its passage through the city of Fort Smith. The area of destruction, and apparently the force of the wind, was greater on the south or right-hand side than on the north or left-hand side. The damage to property was very light at distances exceeding 400 feet on the south side and 250 feet on the north side. The total damage to property is estimated at \$450,000. The Weather Bureau Observer, standing within the skylight, on the roof of the Observatory, 54 feet above the ground and 450 feet north of the central portion of the track, could see on a level with his eye and higher up, objects flying out of the cloud toward the north and west. The testimony of those who live on either side of the tornado path confirms the conclusion that the precipitation was heavier on the south than on the north side.

The readings of the barometer were: 11th, 8 p. m., 28.846, and the same at midnight. At 12:45 the barometer read 29.010. The lowest pressure, as deduced by correcting the barograph record, was apparently 28.67, but as the barograph clock had unfortunately become disordered a few days before there is no record of the time of this minimum. This depression could not have lasted more than a minute; it occurred in the midst of a general depression of about 0.30 which had continued since 4 p. m. of that date. The collapse of the dwelling of Mrs. Mivelaz, which was about 200 feet south of the center of the path, is the principal evidence of a decidedly sudden local diminution in pressure.

The anemometer record shows that the extreme velocity of 60 miles within a minute also occurred at 12:08 or 12:09.

The corrected thermograph record shows a fall from 73° at midnight to 62° at 12:10 a. m. of the 12th, but this fall may easily have been due to the wetting of the dry bulb by reason of the high winds at that moment. On the other hand, this may also represent the lower temperature of the rain and vapor within the cloud, a few hundred feet north of the central tornado. Some of the debris from the tornado seems to have been found the next day at Ozark, Ark., 30 or 35 miles distant, toward the east-northeast. Another tornado occurred an hour previous, i. e., at 11 p. m. of January 11, at Alma, Crawford Co., Ark., 20 miles northeast of Fort Smith.

NOTES BY THE EDITOR.

MOUNTAIN STORMS.

A correspondent, Mr. L. D. Woodfill, Highhouse, Fayette Co., Pa., asks the following questions. Any information will be thankfully received:

In this part of the country, near Uniontown, Pa., we always hear a loud roaring, as of great winds, from six to twelve or sixteen hours preceding a mountain storm. During this roaring, which appears to be in the mountain, 6 miles off, it is almost a perfect calm here. What is the cause? I am told that this phenomena only occurs in the southwest part of Fayette Co., Pa.

DR. WALTSMATH'S MOON.

A circular letter addressed to the Editor of the MONTHLY WEATHER REVIEW by Dr. George Waltemath of Hamburg, requested that observations be made on February 3 for the purpose of discovering whether or no any small, round, black spot could be seen crossing over the sun's disk, corresponding to the hypothetical small moon or large meteoric body which Dr. Waltemath thinks must exist, circulating around the earth in about one hundred and seventy-seven days or a little less than six months. Although there could be no rational expectation of the existence of such a body, yet, as the observations were easy to make and would afford an ab-

solute confirmation or refutation of this new theory, the Editor requested Professor Bigelow to allow the use of his 4-inch telescope, for the purpose of the search. The same glass had been used by Mr. R. H. Dean in observing the transit of Mercury, November 10, 1894, when, as now, it was arranged so as to cast a well-defined image of the sun about 5 inches in diameter, upon a sheet of white paper, at the rear of a photographic camera box. The definition was sufficiently clear to allow an object, whose apparent diameter is 5 seconds of arc, to be distinctly seen. In addition to cursory observations by Professor Bigelow and the Editor, a more careful examination was made at 12 noon, 1, 2, 3, and 4 p. m., by Mr. Dean. The day was clear and the atmosphere very favorable but no sunspots or other objects were seen on the projected image of the sun.

With regard to the corresponding observations of the transit of Mercury, November 10, 1894, Mr. Dean had at that time reported—

The first appearance of the image as a clearly defined black spot on the west limb of the sun's projected image was at 10h. 57m. 50s., seventy-fifth meridian mean time. The entire image was visible at 10h. 59m. 0s. At the close of the transit there was no light between the edge of Mercury and the edge of the sun at 4h. 9m. 15s., but it wavered until 4h. 10m. 0s., when the two edges were clearly in contact

and so remained until 4h. 10m. 50s., when a cloud obscured the image and prevented further observation. The times were carefully determined by comparison with the noon signal on the Navy Department building which can be seen from the Weather Bureau building.

As the diameter of Mercury during its transit in 1894 was about 10 seconds, and as no spot was seen by Mr. Dean on February 3, 1898, we must infer that the small moon required by Waltemath's theory does not exist.

Dr. Waltemath states that:

One hundred and six anomalistic rotations of the new satellite are almost exactly equal to the 35-year period in climatic changes established by Professor Bruckner, and that, therefore, the existence of this satellite may have an especial interest to meteorologists.

On this point the Editor must differ with him inasmuch as we can not see any reason why either the small hypothetical or the large and actual satellite of the earth should have any appreciable influence, at the present time, upon our meteorology.

RECENT EARTHQUAKES.

December 29, 6^h 32^m 43^s a. m., Port au Prince, Hayti, W. I. Prof. T. Scherer reports as follows:

A severe earthquake was experienced at Port au Prince last-ing one minute and thirty-one seconds. The following are the conclusions to be drawn from the curves traced by the Secchi seismograph at the meteorological observatory of the College of St. Martial.

The entire phenomenon consisted of five consecutive shocks, the total duration of which was forty-eight seconds, and of a series of feeble movements very perceptible to an attentive observer. The first shock lasted eight seconds, it began from east-northeast and ended from west-southwest. The vertical component was quite strong at about the fifth second. The movement immediately began with more force in the horizontal direction and less in the vertical; this lasted eleven seconds, and the direction from which it came was more toward the east. The third shock lasted three seconds, and was characterized by a very regular oscillatory movement. The fifth shock was the strongest, lasted ten seconds, began from the northeast, and died away in the southwest, with a vertical component that was scarcely appreciable. All the other movements, after the forty-eighth second, were feeble, with the same horizontal direction. During all this time the seismic pendulum described ellipses in the sand whose major axes varied from northeast through the south to southwest. The Bertelli microseismometer was for a long time agitated and finally maintained a north-south direction.

The same earthquake was felt in the neighborhood of Port au Prince and with the same features. It seems to have been very violent in the interior of the island of Dominica.

January 1, 5:15 a. m., Peachland, Cal., earthquake, vibration east and west; duration, 2 to 3 seconds.

11th, Lakeside, Wash., slight shocks of earthquake.

13th, Laramie, Wyo., slight shock of earthquake about midnight, duration about fifteen seconds.

14th, Lakeside, Wash., slight shocks of earthquake.

15th, Lakeside, Wash., slight shocks of earthquake.

26th, Helena, Ark., 7:35 p. m., slight earthquake, no serious damage.

Prof. Edward W. Morley, of Adelbert College, Cleveland, Ohio, and Prof. C. F. Martin, of the Weather Bureau at Washington, report that no earthquakes disturbed their respective seismographs during January.

THUNDERSTORMS IN CALIFORNIA.

Mr. Barwick has called the attention of the Editor to an article on the above subject that had been overlooked by him in preparing his notes for the MONTHLY WEATHER REVIEW for December, 1897, page 539. This article is by Mr. John D.

Parker, and calls attention to the infrequency of thunderstorms in southern California. (See the American Meteorological Journal, June, 1895, Vol. XII, page 51.) Among other things, Mr. Parker says:

The Weather Bureau has reported only two electrical storms at San Diego during the past sixteen years. One of these occurred on August 27, 1894, and it may be taken as a type of all the electrical storms in this region. On that day there prevailed a close, sultry atmosphere, with a stoppage of the sea breeze, replaced by fitful currents of hot air from the desert, and a filmy vapor cast a slight veil over the face of the sun. About midday the observer at San Diego, from the roof of his building, saw far to the south fifteen or twenty very small thunderheads, appearing conical above, with flat bases. These thunderheads moved slowly northward along the San Jacinto mountain range, and arrived opposite San Diego about sunset, where, by the enlargement of the visual angle, they seemed to fill the whole heavens with black masses of cloud. The edge of this Sonora brushed by San Diego that evening, with an electrical display which was quite vivid in the mountains.

Lightning sometimes plays a little among the clouds far out over the ocean, and occasionally thunder mutters in the mountains, but the Weather Bureau reports that during the last sixteen years not a single thunderstorm arising from general cyclonic action has occurred at San Diego. The thunderstorms of this region are Sonoras, that move northward two or three times a year from Sonora and contiguous regions, where they originate. They seem to be formed, like ordinary thunderstorms, from vapors evaporated from the Gulf of California and regions lying adjacent, and, moving northward along the San Jacinto Range on both sides of the mountains, exhibit electrical displays until their forces are exhausted and they are dissipated.

The explanatory hypotheses suggested by Mr. Parker in the rest of his article are suggestive and interesting, but need a further elaboration before arriving at a satisfactory solution of the problem.

SNOW ROLLERS.

Mr. T. B. Jennings, section director, in his report of the Kansas section for January, says:

A decidedly unusual phenomenon occurred in Saline County during the snowstorm on the 14th, which would indicate that the conditions which produce hailstorms in warm weather may prevail in cold weather, the temperature for the day ranging between 34° and 25°. Over a narrow belt about 12 miles long, extending from southeast of Bavaria to north of the Saline River, late that evening, a fall of snowballs occurred, ranging "from the size of baseballs to half-bushel measures." They do not seem to have been hard, yet they were still to be seen scattered about the fields by persons who went out the next Sunday, the 16th, to view them.

As freshly fallen snow is often rolled into balls and cylinders by a gentle wind, we presume that the balls in Saline County may have been a case of "snow rollers."

BRIGHT METEORS.

Notices in the daily press have been published with regard to a bright meteor observed at 1 p. m. at San Jose, Cal., by Mr. Paddington of the Lick Observatory. It was seen in the west at an elevation of about 8° above the horizon, moving rapidly toward the north in a path slightly inclined toward the earth. It increased in brightness along its course and disappeared suddenly in a clear sky.

Reports of a great meteor seen at Dubois, near Boise City, Idaho, about January 25, have been received, but no reliable details are given.

NOTES FROM THE REPORTS OF STATE SECTIONS.

MONTANA.

Mr. Walter A. Clark, of Choteau, Mont., proposes to experiment with the box kite for carrying up the cold wave, or norther, flag signal.

The Secretary of Agriculture has directed that the voluntary observers and the Climate and Crop correspondents of the Weather Bureau, be included among those to receive the seeds gratuitously distributed by the Department.

Mr. Coe, of Kipp, Mont., says: "Probably there is no locality in the Western States where the chinook phenomena are so prettily illustrated

as at this station. Lying due west is an extensive ravine about 30 miles long, reaching from the foothills to the summit of the main range of the Continental Divide. Within the confines of this great canyon are three lakes, varying in length from 1 to 3 miles in extent, the upper lake being about 1,000 feet above the lower. When a chinook is blowing, a billowy mass of vapor hangs over the upper lake like a great mass of cotton, white, unchanged in form, unvarying in shade, for hours at a time. It is a very beautiful spectacle and is known as the "white flag of the chinook."

NEVADA.

Mr. Charles G. Fogg, of Silver Peak, Nev., reports "On the 29th, Pogonip all over the valley."

In general, the Section Director, Mr. R. F. Young, notes that an area of high pressure, clear, cold, dry air, with light winds from the north, prevailed throughout the month, with more frost than usual. These are the conditions that favor the Pogonip, which is a mist of ice crystals or frozen fog and very injurious to the health of men and animals. Some remarks on the Pogonip will be found in the MONTHLY WEATHER REVIEW for February, 1894, Vol. XXII, page 77. We should be glad to publish a special study of the Pogonip in any one of the valleys of Nevada.

ARKANSAS.

The detailed report of the Fort Smith tornado and that of the Crawford County tornado will be found in the January report of the Arkansas Section.

NEW ENGLAND.

A detailed account of the snowstorm and resulting damage in New England on the 25-26th and on the 31st will be found in the report of the New England Section. The blizzard of January 31-February 1 was comparable with that of March, 1888, and December, 1872, and January, 1867.

MARYLAND.

The report of the Maryland and Delaware Section gives an account of the establishment of twenty special stations by the Maryland State Weather Service, which is now enabled to take up profitable lines of research bearing upon the physiography, climatology, hydrography, forestry, and crops of that State. The work will be done in cooperation with the United States Geological Survey and the various bureaus and divisions of the United States Department of Agriculture. The problems to be first taken in hand will be "The influence of Chesapeake Bay and of the mountains of Washington County upon the crops in their respective vicinities. Four series of three special stations each will be established, reaching from the water's edge of Chesapeake Bay inland, and the twelve stations will represent the soils devoted to garden truck, wheat, corn, and fruit. Eight or more stations will also be established in Washington County at different elevations upon the mountain slopes, representing the upper and lower limits of successful cultivation of peaches. Observations of the temperature and moisture of the soil will be made in addition to the meteorological observations."

One can but hope that important economical results will flow from this notable effort on the part of Professor Clark and the State legislature to thus extend the work of the State service from the mere field of observation over into the field of agricultural investigation. Studies of a general character in this matter of the relations between climate and crops have been taken up by isolated agricultural experiment stations, and pretty much all that was known on the subject ten years ago was collected by the Editor in his report of June 30, 1891. The present investigation by Professor Clark is undoubtedly the most extensive that has yet been undertaken by any State or Government.

TENNESSEE.

In the report of the Tennessee section Mr. H. C. Bate, section director, states that he has on hand a number of the

earlier copies of these reports and other publications which will enable him to supply missing numbers to those who desire to complete their sets. We are sure that many students of climatology, in foreign countries as well as in the United States, will gladly avail themselves of this offer.

SPECIAL SNOWFALL BULLETINS.

A year ago Mr. Brandenburg, director of the Colorado State section of the Climate and Crop Service, initiated a system of special reports on the snowfall, which was found very useful in forecasting the quantity of water that became available for irrigation when the snow melted. We take pleasure in noting the fact that Mr. Blythe, in charge of the Arizona section, has published a similar special snow bulletin for that State. At the close of January there was more snow than usual still remaining on the ground at many stations, while others reported that, although the snow had disappeared, yet the ground was thoroughly soaked, and the cold weather had caused the retention of an unusual quantity of water in the soil, so that, on the whole, there was a good prospect of an abundance of water for agricultural purposes.

THE ALMANACS AND THE WEATHER BUREAU.

During the past few months the Editor has noticed a number of newspaper paragraphs discussing the relative merits of the weather predictions published daily by the officials of the Weather Bureau for one or two days in advance, and those published by the numerous "farmers' almanacs," published several months, or even a year, in advance, and sold in large numbers throughout the country. The predictions of the weather, as made by the Weather Bureau, are based entirely upon the daily maps that show the actual condition of the atmosphere, as reported by reliable observers throughout the country. On the other hand, the predictions in the various almanacs are founded upon a variety of principles among which are the following:

1. The most conservative and rational almanacs are those that compile from the records of many past years a table showing what sort of weather has prevailed most frequently on the respective days of the year.

2. The least rational almanacs are those that pretend that the weather is controlled by planetary combinations and stellar influences, therefore, such predictions are properly said to be based upon astrology.

3. An intermediate class publishes predictions based upon the probability of spots on the sun, thereby assuming it to have been demonstrated that the solar spots control terrestrial weather.

4. The least scientific system of preparing the almanac predictions was explained to the Editor many years ago by a gentleman whose almanac made the greatest pretensions to high scientific accuracy. This gentleman stated that on certain days he felt endowed with a certain ability or inspiration. These were his weather making days, on which he sat down, and with the most absolute confidence in the accuracy of his work, wrote up the weather for the coming year, continuing at the work for a considerable time until the inspiration seemed to leave him, whereupon he necessarily stopped and delayed resuming the work until again filled with the spirit of divination.

Doubtless some almanac makers adopt a combination of the four preceding methods but, in general, these seem to be the principles most widely recognized in the long-range predictions of the almanacs, except only that in all cases the authors make free use of a system of general and rather indefinite terms that will apply just as well to a thunderstorm, a hurricane, or an earthquake. The warning "look out for something very unusual about this time" is, of course, not a

meteorological prediction, and not nearly as definite as the railroad signboard "look out for the engine when the bell rings."

It must be acknowledged that the Weather Bureau has done wisely in abstaining from any attempt to make long-range predictions, based upon any or all of the four methods above mentioned. The method that is actually used in its daily work has nothing of the absurd profundity of the astrological method, but is based upon the simplest common sense. The hope of the Bureau, as expressed by General Myer in 1871, still continues to be our earnest aim, namely, to so educate every citizen that he may take an intelligent view of the daily weather maps and learn to make his own local predictions.

In connection with meteorology in general, and especially weather predictions, there is a popular tendency to make a mistaken use of the word "science." Knowledge is science as distinguished from the world of imagination, which is fiction. Whatever is logical and true may be called scientific, but whatever is illogical or untrue is certainly not scientific. A map or a survey that gives us an exact picture of the true location of every spot on the earth's surface responds to scientific geography. A catalogue of all the plants and animals on the earth or of the stars in the sky constitutes a biological or an astronomical survey, and is truly scientific. A series of maps of the weather at 8 a. m. daily is a scientific meteorological work, and any predictions of the weather that can be logically deduced from these maps is a scientific prediction. But a lot of predictions that are said to be deduced in defiance of sound logic and with a very imperfect knowledge of the laws of nature are fanciful fictions and not scientific, because they are contrary to all sound knowledge. Science can not possibly go contrary to the truth. Most scientific knowledge is so simple that it is taught in the schools to the children. There is not a child of the ten millions who attend

our public schools who has not been taught that the stars and planets have no influence on human affairs. On the other hand, there are some fields of study that are so difficult that only a few have time and taste to devote to them. These may, if one pleases, be called the most profound depths of science, but they are perfectly accessible to every logical student, and a century hence this profound science will have become clear to all and will be taught in our schools just as we now teach that which was unknown in the time of Gallileo and which is even yet untaught in the schools of Turkey and China.

In the preceding lines we have had in mind the average or normal American citizen, one who believes that two and two are four and that a straight line is the shortest distance between two points, and all the other axioms and principles of natural science. On the other hand, we must recognize the fact that there is quite an appreciable percentage of human beings who do not accept these principles. These are those who can demonstrate that the world is flat; that the earth does not revolve daily or annually; who believe in squaring the circle, in perpetual motion, the Keely motor, and other incongruities. The philosopher De Morgan has well styled this class of humanity as "paradoxers." They can assent to the truth of principles and facts that the rest of the world can never indorse; they belong to a different part of the universe from that world in which we live, to a place where white is black, where *yes* means *no*, where a part is greater than the whole, where time runs backward, where the material controls the spiritual. It is conceivable that the Creator may have created many distinct systems of worlds and that the laws which obtain in our part of the universe do not hold good everywhere. The science that we are studying is simply the knowledge of the principles and the facts that belong to our part of the universe, where the "paradoxers" are entirely out of place.

METEOROLOGICAL TABLES AND CHARTS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

Table I gives, for about 130 Weather Bureau stations making two observations daily and for about 20 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the departures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,700 stations occupied by voluntary observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station; the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (. . .).

Table III gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table IV gives, for 26 stations selected out of 113 that main-

tain continuous records, the mean hourly temperatures deduced from thermographs of the pattern described and figured in the Report of the Chief of the Weather Bureau, 1891-92, p. 29.

Table V gives, for 26 stations selected out of 104 that maintain continuous records, the mean hourly pressures as automatically registered by Richard barographs, except for Washington, D. C., where Foreman's barograph is in use. Both instruments are described in the Report of the Chief of the Weather Bureau, 1891-92, pp. 26 and 30.

Table VI gives, for about 130 stations, the arithmetical means of the hourly movements of the wind ending with the respective hours, as registered automatically by the Robinson anemometer, in conjunction with an electrical recording mechanism, described and illustrated in the Report of the Chief of the Weather Bureau, 1891-92, p. 19.

Table VII gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind. The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division the average resultant direction for that division can be obtained.

Table VIII gives the total number of stations in each State from which meteorological reports of any kind have been re-

ceived, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table IX gives, for about 70 stations, the average hourly sunshine (in percentages) as derived from the automatic records made by two essentially different types of instruments, designated, respectively, the thermometric recorder and the photographic recorder. The kind of instrument used at each station is indicated in the table by the letter T or P in the column following the name of the station.

Table X gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes..	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates pr. hr. (ins.)..	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table XI gives the record of excessive precipitation at all stations from which reports are received.

NOTES EXPLANATORY OF THE CHARTS.

Chart I.—Tracks of centers of high pressure. The roman letters show number and order of centers of high areas. The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. The queries (?) on the tracks show that the centers could not be satisfactorily located. Within each circle is given the highest barometric reading reported near the center. A blank indicates that no reports were available. A wavy line indicates the axis of a ridge of high pressure.

Chart II.—Tracks of centers of low pressure. The roman letters show number and order of centers of low areas. The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the 8 a. m. and 8 p. m., seventy-fifth meridian time, observations. The queries (?) on the tracks show that the centers could not be satisfactorily located. Within each circle is given the lowest barometric reading reported near the center. A blank indicates that no

reports were available. A wavy line indicates the axis of a trough or long oval area of low pressure.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all, by 0.0.

Chart IV.—Sea-level isobars and isotherms, and resultant winds. The wind directions on this Chart are the computed resultants of observations at 8 a. m. and 8 p. m., daily; the resultant duration is shown by figures attached to each arrow. The temperatures are the means of daily maxima and minima and are reduced to sea level. The pressures are the means of 8 a. m. and 8 p. m. observations, daily, and are reduced to sea level and to standard gravity. The reduction for 30 inches of the mercurial barometer, as shown by the marginal figures for each degree of latitude, has already been applied.

Chart V.—Hydrographs for seven principal rivers of the United States.

Chart VI.—Surface temperatures; maximum, minimum, and mean. Lines of equal monthly mean temperature in red; lines of equal maximum temperatures (broken) in black; and lines of equal minimum temperature (dotted) also in black.

Chart VII.—Percentage of sunshine. The average cloudiness at each Weather Bureau station is determined by numerous personal observations during the day. The difference between the observed cloudiness and 100, it is assumed, represents the percentage of sunshine, and the values thus obtained have been used in preparing Chart VII.

Chart VIII.—The total snowfall. This is based on the reports from all available observers and shows the depth of the snowfall during the month in inches. In general, the depth is shown by lines and areas of equal snowfall, but in some cases figures are also given for special localities.

Chart IX.—Depth of snow on ground. This chart is based essentially upon reports from regular and special observers and shows the depth of snow lying on the ground at the end of the month, which is, therefore, the accumulated excess of the snowfall over its loss by melting, evaporation, and settling.

Charts X-XIII.—These charts present the conditions as shown on the daily weather maps during the progress of the severe storm of January 31.

MONTHLY WEATHER REVIEW.

JANUARY, 1898

TABLE I.—Climatological data for Weather Bureau Stations, January, 1898.

Stations.	Elevation of instruments.			Pressure, in inches.		Temperature of the air, in degrees Fahrenheit.										Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.				
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Mean actual, 8 a. m. and 8 p. m. + v.	Mean reduced.	Departure from normal.	Mean max. and min. + 2.	Departure from normal.	Maximum.	Date.	Mean minimum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.						Prevailing direction.	Maximum velocity.		
																													Miles per hour.	Direction.	
New England.																															
Eastport	76	69	74	29.85	29.94	-.06	27.0	+.02	42	7	27	-9	4	10	31	17	13	76	4.57	+.06	15	10,842	n.	60	e.	23	9	8	14	5.6	26.9
Portland, Me.	109	81	89	29.84	29.95	-.10	21.4	-.1	45	13	29	-3	4	14	33	19	15	78	6.61	+.30	13	5,585	n.w.	36	ne.	31	10	12	9	5.1	41.6
Northfield	872	15	59	29.01	30.03	-.04	13.1	-.4	56	13	25	-22	6	30	27	20	11	8	3.30	-.02	15	5,930	s.	36	sw.	8	6	11	14	6.3	34.5
Boston	125	115	181	29.84	29.98	-.09	28.7	+.1	55	13	36	1	30	22	30	26	30	72	3.90	+.06	10	8,496	n.w.	39	ne.	31	13	5	13	5.2	16.3
Nantucket	14	43	54	29.96	29.97	-.07	32.8	+.1	55	13	36	1	30	22	30	26	30	72	3.90	+.06	10	8,496	n.w.	39	ne.	31	13	5	13	5.2	16.3
Woods Hole	22	51	57	29.96	29.97	-.07	32.8	+.1	55	13	36	1	30	22	30	26	30	72	3.90	+.06	10	8,496	n.w.	39	ne.	31	13	5	13	5.2	16.3
Vineyard Haven	30	39	48	29.96	29.99	-.10	30.4	+.1	52	20	36	5	30	25	30	...	...	...	2.76	-.10	14	9,760	n.w.	71	se.	31	7	9	15	6.7	3.1
Block Island	27	39	48	29.96	29.99	-.10	30.6	+.2	54	20	41	6	30	25	30	...	...	...	3.94	+.02	9	12,719	w.	52	sw.	3	15	9	7	4.0	6.8
Narragansett Pier	10	...	...	29.96	29.99	-.10	30.6	+.2	54	20	41	6	30	25	30	...	...	...	3.94	+.02	12	...	n.w.	...	...	11	11	9	...	...	2.1
New Haven	107	118	140	29.88	30.00	-.12	29.4	+.1	55	13	36	0	30	22	30	25	21	74	4.96	+.06	15	7,497	n.	44	w.	23	10	9	12	5.7	10.1
Mid. Atl. States.																															
Albany	97	84	113	29.92	30.03	-.07	24.5	+.3	54	13	32	-12	30	17	36	18	79	2.86	+.01	15	5,622	s.	32	w.	8	3	12	16	7.4	19.8	
Binghamton	875	79	90	29.92	30.03	-.07	24.5	+.3	54	13	32	-12	30	17	36	18	79	2.86	+.01	15	5,622	s.	32	w.	8	3	12	16	7.4	19.8	
New York	314	208	325	29.67	30.02	-.10	32.2	+.1	55	23	38	5	30	26	19	29	24	74	3.95	-.01	15	10,090	n.w.	61	w.	23	7	14	10	6.0	8.7
Harrisburg	377	94	102	29.64	30.07	-.05	32.8	+.2	54	8	38	12	30	28	22	25	23	70	3.23	-.04	13	6,945	w.	52	w.	23	5	9	17	7.1	7.5
Philadelphia	117	168	184	29.92	30.05	-.11	35.4	+.3	58	23	41	12	2	30	27	32	27	72	4.10	+.07	15	7,837	n.w.	41	w.	23	5	13	13	6.6	10.6
Atlantic City	52	68	76	29.99	30.05	-.08	36.0	+.3	58	13	42	15	30	32	19	...	...	...	3.06	-.03	12	4,097	w.	32	sw.	23	6	14	11	5.7	5.4
Cape May	34	52	70	30.04	30.06	-.11	37.0	+.3	60	8	43	17	2	31	25	33	28	73	2.99	-.03	12	4,097	w.	32	sw.	23	6	14	11	5.7	5.4
Baltimore	123	68	82	29.92	30.05	-.11	37.0	+.3	60	8	43	17	2	31	25	33	28	73	2.99	-.03	12	4,097	w.	32	sw.	23	6	14	11	5.7	5.4
Washington	112	59	76	29.93	30.08	-.10	36.6	+.3	63	13	47	15	2	31	32	34	29	71	2.16	-.18	13	3,838	n.w.	35	n.	23	13	7	11	5.5	3.0
Cape Henry	5	34	...	30.11	30.11	-.06	39.2	+.2	63	13	47	15	2	31	32	34	29	71	2.16	-.18	13	3,838	n.w.	35	n.	23	13	7	11	5.5	3.0
Lynchburg	685	83	88	29.34	30.11	-.06	44.4	+.4	75	15	53	20	2	36	31	40	37	81	1.44	-.24	12	7,251	ne.	38	n.	31	11	6	14	5.4	T.
Norfolk	57	88	93	30.03	30.10	-.06	44.4	+.4	75	15	53	20	2	36	31	40	37	81	1.44	-.24	12	7,251	ne.	38	n.	31	11	6	14	5.4	T.
Richmond	144	98	105	30.03	30.10	-.06	44.4	+.4	75	15	53	20	2	36	31	40	37	81	1.44	-.24	12	7,251	ne.	38	n.	31	11	6	14	5.4	T.
S. Atlantic States.																															
Charlotte	773	68	76	29.36	30.11	-.07	45.0	+.3	72	10	53	15	2	37	36	39	33	71	1.63	-.27	14	5,869	sw.	38	sw.	23	11	10	10	5.7	1.0
Hatteras	11	17	36	30.09	30.10	-.06	48.6	+.2	70	20	54	25	2	43	35	47	44	85	2.21	-.37	11	11,574	n.	48	w.	31	14	9	8	4.8	T.
Kittyhawk	9	12	30	30.12	30.12	-.06	47.2	+.4	73	12	53	16	2	37	29	39	34	71	1.81	-.18	11	5,294	w.	31	sw.	12	10	9	12	5.7	1.0
Raleigh	373	93	101	29.71	30.12	-.06	45.2	+.4	73	12	53	16	2	37	29	39	34	71	1.81	-.18	11	5,294	w.	31	sw.	12	10	9	12	5.7	1.0
Wilmington	78	81	90	30.04	30.13	-.04	50.4	+.4	77	12	60	18	2	41	27	45	42	81	1.40	-.25	6	7,121	w.	36	sw.	23	17	7	7	3.6	T.
Charleston	48	14	92	30.12	30.17	-.01	54.9	+.4	77	10	62	27	2	48	21	48	42	69	0.19	-.38	4	7,853	sw.	30	w.	31	9	18	4	4.9	0.2
Columbia	5	...	...	30.14	30.14	-.03	51.2	+.2	76	11	61	18	2	42	33	43	40	72	1.72	-.28	10	5,151	w.	36	s.	23	12	5	14	5.6	T.
Augusta	180	89	103	29.94	30.16	-.04	55.5	+.4	79	11	65	23	2	46	29	48	44	74	0.36	-.29	8	6,744	n.w.	30	n.	23	16	8	7	4.2	T.
Savannah	82	63	89	30.07	30.16	-.04	55.5	+.4	79	11	65	23	2	46	29	48	44	74	0.36	-.29	8	6,744	n.w.	30	n.	23	16	8	7	4.2	T.
Jacksonville	43	69	84	30.12	30.17	-.01	55.7	+.4	81	25	69	24	2	50	28	52	50	81	0.43	-.28	7	5,216	sw.	24	se.	20	13	16	2	4.3	3.3
Florida Peninsula.																															
Jupiter	28	13	30	30.14	30.17	+.01	64.8	+.0	83	23	72	31	3	58	26	59	56	77	0.36	-.31	6	6,638	n.w.	30	s.	22	15	13	3	3.8	0.8
Key West	22	42	50	30.16	30.18	+.04	70.0	+.3	82	19	74	46	3	66	15	64	62	79	0.34	-.18	5	7,103	ne.	40	n.	1	21	7	3	3.1	5.7
Tampa	36	60	67	30.14	30.18	+.04	62.2	+.3	85	21	72	27	3	53	28	55	52	80	0.42	-.21	5	4,426	n.w.	24	n.	1	14	16	1	3.2	5.7
East Gulf States.																															
Atlanta	1,131	92	126	28.93	30.16	-.05	46.9	+.4	73	11	54	17	2	40	27	43	41	84	2.99	-.32	11	8,645	n.w.	43	sw.	22	8	7	16	6.3	0.8
Pensacola	56	78	90	30.11	30.17	-.02	56.4	+.3	72	11	63	20	2	50	24	52	49	80	1.75	-.29	14	6,680	n.	34	w.	19	13	8	10	5.0	...
Mobile	57	88	96	30.11	30.17	-.02	56.4	+.3	72	11	63	20	2	50	24	52	49	80	1.75	-.29	14	6,680	n.	34	w.	19	13	8	10	5.0	...
Montgomery	221	100	107	29.91	30.15	-.05	52.7	+.4	79	12	61	18	2	44	31	49	46	83	1.52	-.38	13	5,667	w.	35	w.	19	11	5	15	6.4	...
Vicksburg	254	65	73	29.83	30.10	-.09	52.9	+.4	79	12	61	18	2	44	31	49	46	83	1.52	-.38	13	5,667	w.	35	w.	19	11	5	15	6.4	...
New Orleans	54	112	130	30.10	30.16	-.00	58.6	+.4	78	11	66	30	2	52	28	53	49	78	1.71	-.35	15	7,667	s.	43	w.	22	10	10	11	5.6	...
Port Eads	27	...	...	30.16	30.16	-.00	60.4	+.3	75	10	67	31	2	54	28	...	...	...	0.80	-.36	9	...	s.	...	...	12	3	16	...	...	...
West Gulf States.																															
Shreveport	249	77	84	29.82	30.10	-.09	52.5	+.6	80	9	61	24	2	46	29	46	41	72	5.79	+.12	13	6,213	sw								

TABLE I.—Climatological data for Weather Bureau Stations, January, 1898—Continued.

Stations.	Elevation of instruments			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Precipitation, in inches.		Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.					
	Barometer above sea level, feet.	Thermometers above ground.	Anemometers above ground.	Mean actual, 8 a. m. and 8 p. m. + 2.	Mean reduced.	Departure from normal.	Mean max. and min. + 2.	Departure from normal.	Maximum.	Date.	Mean minimum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.						Prevailing direction.	Maximum velocity.	Miles per hour.	Direction.	Date.
Up. Miss. Val.—Con																																
Dubuque	698	101	110	29.26	30.06	-.07	24.1	+6.8	44	7	32	4	1	16	27	21	18	80	2.19	+.05	9	5,159	nw.	30	nw.	31	13	6	12	5.0	15.1	
Keokuk	614	64	78	29.38	30.07	-.08	30.0	+6.8	52	7	37	4	1	16	23	23	34	33	3.13	+.14	11	5,909	sw.	30	sw.	30	13	4	14	5.1	14.3	
Cairo	359	87	93	29.68	30.08	-.09	41.6	+6.9	70	9	49	12	1	31	30	24	18	80	6.26	+.24	12	7,493	sw.	56	sw.	57	15	11	11	6.3	0.4	
Springfield, Ill.	644	82	92	29.34	30.06	-.11	32.2	+6.7	58	12	38	6	1	24	24	18	78	78	5.81	+.38	12	7,732	nw.	34	sw.	34	10	12	6.1	4.7		
Hannibal	534	75	107	29.45	30.08	-.08	32.2	+6.3	56	12	40	6	1	24	24	18	78	78	3.64	+.21	11	7,014	sw.	39	sw.	39	14	5	12	5.2	11.5	
St. Louis	567	111	210	29.45	30.08	-.08	37.3	+6.8	63	12	44	10	1	31	31	25	34	34	4.53	+.24	11	8,344	w.	66	sw.	66	11	7	13	5.8	0.9	
Missouri Valley.																																
Columbia	4	84		29.04	30.11	-.09	34.2	+4.2	63	7	44	8	1	25	25	19	78	78	3.37	+.15	10	7,310	e.	38	sw.	25	8	6	17	6.5	6.9	
Kansas City	963	78	95	29.04	30.11	-.09	32.4	+7.0	58	9	39	12	1	31	31	25	34	34	4.12	+.29	10	5,195	nw.	33	s.	33	7	9	7	15	6.2	21.9
Springfield, Mo.	1,324	100	103	28.61	30.06	-.10	37.7	+5.4	62	9	44	12	1	31	30	24	30	30	3.06	-.07	11	8,889	se.	48	w.	25	4	13	14	6.5	1.5	
Topeka	81			29.75	30.09	-.09	31.7	+4.9	59	7	39	10	1	23	23	18	39	39	2.18	-.10	9		n.									
Lincoln	1,199	74	84	28.75	30.09	-.10	29.3	+11.6	49	9	37	8	1	29	29	21	73	73	0.83	-.01	7	6,405	se.	34	nw.	30	14	7	10	5.0	8.3	
Omaha	1,103	92	97	28.86	30.10	-.10	28.3	+9.1	45	9	35	8	1	29	29	21	73	73	0.62	-.01	7	4,844	nw.	24	n.	25	14	4	13	5.0	6.1	
Sioux City	1,139	96	164	28.42	30.06	-.14	24.0	+7.7	40	5	32	4	1	29	16	30	25	80	0.27	-.06	5	7,329	nw.	43	nw.	28	15	4	12	4.8	4.3	
Pierre	1,460	50	61	28.42	30.06	-.14	26.0	+13.3	53	3	38	3	1	31	14	37	18	80	0.01	-.05	1	4,827	se.	36	nw.	28	16	11	4	3.5	0.1	
Huron	1,306	56	67	28.61	30.09	-.12	23.3	+16.3	47	5	34	4	1	29	12	38	30	83	0.01	-.05	1	7,215	se.	38	nw.	30	17	10	4	4.1	0.1	
Yankton	1,234	52	58	28.61	30.09	-.12	26.3	+12.1	48	3	36	1	1	29	17	32	30		0.34	-.02	4	5,334	nw.	28	nw.	28	20	6	5	3.3	4.6	
Northern Slope.																																
Havre	2,494	46	47	27.25	30.01	-.04	21.6	+11.9	41	2	32	14	24	12	42	19	16	81	0.17	-.07	5	7,972	sw.	39	sw.	8	12	13	6	4.6	1.7	
Miles City	2,372	41	49	27.44	30.07	-.11	22.0	+11.4	44	4	32	10	25	12	32	18	15	83	0.17	-.04	6	3,976	s.	30	w.	30	14	10	7	4.5	1.7	
Helena	4,108	88	93	25.80	30.19	-.07	23.2	+6.1	41	5	30	1	24	16	27	21	15	68	0.20	-.12	5	4,862	sw.	34	sw.	27	9	12	10	5.4	2.6	
Rapid City	3,251	46	50	26.55	30.08	-.10	25.4	+5.2	57	4	36	1	24	16	27	21	15	72	0.56	-.02	5	4,679	w.	35	nw.	3	15	10	6	4.1	5.8	
Cheyenne	6,105	58	60	23.89	30.21	-.02	24.9	+0.1	58	4	36	1	24	16	27	21	15	48	0.48	-.01	3	8,539	nw.	49	nw.	29	14	10	7	4.5	4.8	
Lander	5,372	28	36	24.59	30.33	-.11	10.6	+6.2	46	6	24	2	26	3	39	6	3	82	0.33	-.05	2	1,826	sw.	12	se.	30	18	9	4	3.2	3.3	
North Platte	2,826	43	52	27.06	30.16	-.05	26.8	+6.8	59	3	38	6	26	15	37	21	15	69	0.77	-.03	4	5,304	w.	27	nw.	25	21	6	4	3.6	9.6	
Middle Slope.																																
Denver	5,290	79	151	24.64	30.19	-.00	29.2	+2.0	63	3	41	3	25	17	44	23	12	53	0.20	-.04	2	5,384	s.	36	nw.	5	10	17	4	4.5	3.0	
Pueblo	4,713	74	81	25.25	30.20	-.00	26.5	+2.2	67	2	42	1	25	11	54	20	12	59	0.69	-.03	4	4,510	nw.	33	n.	14	13	5	4.4	7.6		
Concordia	1,398	42	44	28.55	30.11	-.11	30.8	+7.6	64	3	40	5	26	22	35	27	24	82	1.15	-.04	6	3,569	sw.	34	sw.	7	10	8	13	5.5	11.5	
Dodge City	2,504	44	52	27.39	30.13	-.05	29.1	+2.5	66	4	40	0	26	18	50	24	19	74	1.74	-.13	7	5,647	nw.	34	nw.	25	14	10	7	4.5	19.7	
Wichita	1,351	78	85	28.60	30.09	-.07	34.3	+3.7	63	7	42	11	33	26	30	25	74	1.97	-.09	8	5,750	nw.	28	nw.	25	10	8	13	5.7	10.8		
Oklahoma	1,218	54	62	28.75	30.09	-.09	40.4	+9.3	74	11	49	17	1	32	34	36	32	77	4.38	-.25	10	7,974	n.	38	nw.	11	13	7	11	5.0	6.0	
Southern Slope.																																
Abilene	1,749	47	54	28.24	30.13	-.07	46.8	+4.0	75	24	57	21	1	36	33	39	32	64	0.75	-.02	6	7,427	sw.	60	w.	25	11	13	7	4.6	3.0	
Amarillo	3,691	54	61	26.22	30.18	-.05	35.0	+3.4	71	7	46	9	16	24	45	28	19	63	0.86	-.03	7	10,637	s.	56	sw.	11	14	6	11	4.5	5.8	
Southern Plateau.																																
El Paso	3,767	10	110	26.20	30.13	-.00	42.0	+2.5	71	7	55	17	25	28	46	32	18	47	0.25	-.03	6	7,880	nw.	62	sw.	24	16	9	6	3.8	0.1	
Santa Fe	6,908	47	50	23.17	30.17	-.00	34.6	+3.3	64	6	34	1	25	15	27	20	10	56	0.97	-.04	11	4,280	ne.	27	sw.	10	15	9	7	4.5	8.9	
Phoenix	1,076	47	57	28.89	30.05	-.05	47.2	+2.2	73	1	58	23	35	31	39	30	56	1.63	-.11	7	3,046	e.	23	e.	1	15	6	10	4.3			
Yuma	139	16	50	29.92	30.07	+.01	49.8	+1.3	76	1	61	26	32	39	35	41	29	48	0.42	-.00	5	5,724	n.	36	n.	18	22	4	5	2.8		
Middle Plateau.																																
Carson City	4,730	82	92	25.29	30.26	-.09	24.3	+8.0	57	5	38	5	8	11	46	20	13	65	0.52	-.20	8	3,315	ne.	34	w.	16	12	17	2	4.4	7.3	
Winnemucca	4,340	59	70	25.70	30.29	+.09	18.0	+9.0	47	4	31	16	24	5	40	15	77	0.64	-.05	7												
Salt Lake City	4,344	83	90	25.71	30.36	+.11	20.6	+7.3	48	6	29	3	26	12	29	18	14	76	0.58	-.09	9	3,169	se.	22	nw.	30	12	6	13	5.1	5.8	
Northern Plateau.																																
Baker City	3,470	49	55	26.52	30.29	+.05	20.0	+2.8	39	5	28	4	24	12	26	18	14	76	0.82	-.08	13	4,086	s.	22	se.	18	2	14	15	7.1	8.2	
Idaho Falls	4,742	10	56	25.29	30.42	+.18	8.4	+7.7	36	6	20	33	24	3	39	7	4	86	1.76	-.06	15	4,846	n.	37	sw.	22	12	3	16	5.8	20.5	
Spokane	1,943	99	107	28.05	30.19	+.08	26.0	+1.5	40	31	32	2	24	20	20	26	23	85	1.45	-.11	11	2,991	s.	24	s.	8	3	5	23	8.2	13.2	
Walla Walla	1,018	65	73	29.06	30.20	+.04	32.2	+1.7	50	29	37	16	25	27	25																	

TABLE II.—Meteorological record of voluntary and other cooperating observers, January, 1898.

Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alabama.						Arizona—Cont'd.						California—Cont'd.					
Alco†	81	16	54.4	1.89		Signal†	74	21	44.2	1.37		Daunt	63	26	43.0	1.25	
Ashville†	75	17	47.7	5.48		Snowflake	51	—16	23.0	1.47	14.8	Delano*	63	26	43.0	0.78	
Bermuda†	79	16	53.2	2.44		Strawberry	60	—15	26.6	5.10	22.3	Delta*	64	18	39.7	0.75	
Birmingham†	76	17	51.0	5.18		Sulphur Spring Valley				1.27	8.0	Descanso*	68	16	39.6	5.28	17
Bridgeport†				6.90	T.	Texas Hill*	71	28	47.0			Drytown	68	21	41.1	1.40	
Citronelle†	77	20	55.6	2.96		Tombstone	65	12	41.0	0.99	7.5	Dunnigan*	60	23	42.4	2.03	
Clanton†	74	16	48.7	0.82		Tuba	50	—7	23.2	0.78	7.8	Durham*	60	22	40.8	0.70	0.2
Daphne†	80	19	53.2	2.33		Tucson†	73	17	46.2	1.10	6.0	East Brother L. H.				0.95	
Decatur†	77	14	45.8	6.46		Walnut Grove				2.00	T.	Edmonton*	53	6	28.9	1.73	12.0
Elba†	78	16	52.5	3.32		Whipple Barracks†	63	—10	26.8	1.97	11.4	Elsinore	86	24	49.0	2.29	
Eufaula†	81	17	52.1	1.26		White Hills	67	15	36.8	0.87	1.0	Escondido	75	21	43.8	2.48	T.
Eufaula b.				1.31		Willcox*	60	15	35.9	1.25	4.0	Fallbrook†	82	29	46.8	2.65	
Evergreen	77	20	51.1	1.68		Williams	55	—16	25.4	3.00	30.0	Fordyce Dam				2.75	33.0
Florence†				6.99		Arkansas.						Fort Bragg†				1.46	T.
Florence b†	76	19	47.8	7.29		Amity	78	15	46.8	7.14		Fort Ross	66	32	47.0	2.01	
Fort Deposit	77	16	52.6	1.88		Arkansas City†				8.65		Fort Tejon				1.89	24.0
Gadsden	74	18	47.4	4.88		Beebranch	81	23	45.4	6.50		Georgetown	69	20	39.5	2.13	2.5
Goodwater	84	15	49.6	1.45		Blanchard Springs†	77	15	49.2	8.80		Glendora				2.22	
Greensboro†	78	15	49.5	2.37		Camden†				10.85		Goshen*	68	18	40.5	0.31	
Hamilton	75	11	46.6	8.04		Camden b†	78	20	48.5	10.55		Grand Island*	60	22	42.4	0.27	
Healing Springs†	80	15	52.4	2.75		Canton*	67	12	41.2			Grass Valley	54	—3	27.6	1.82	2.0
Highland Home†	76	17	53.6	2.06		Conway	73	14	46.2	6.96		Greenville†	55	24	39.2	0.82	7.0
Jasper	78	15	46.0	7.65		Dallas	70	17	45.0	4.45		Healdsburg*	54	24	39.2	1.61	
Livingston	77	16	52.4	2.50		Dardanelle				4.81		Hill Ranch	80	25	50.6	0.63	1.0
Lock No. 4	74	16	45.6	4.67	T.	Elon†	78			8.43		Hollister	67	21	42.8	0.82	
Madison Station†	75	15	44.0	6.14		Fayetteville†	73	15	41.5	4.62	T.	Humboldt L. H.				3.83	
Maple Grove	79	17	50.5	4.37		Forrest	71	15	46.2	9.10		Indio*	80	24	48.2	0.10	2.0
Marion†	75	14	50.6	2.95		Fulton†				8.99		Iowa Hill*	65	20	36.3	2.04	
Mount Willing†	88	14	56.2	2.20		Hardy	73	12	41.0	5.19		Jackson				1.47	0.5
Newbern†	85	15	51.4	2.42		Helena†				14.22		Jolon				0.85	
Newburg				7.36		Helena b.	74	18	49.6	12.81		Keeler*	57	22	36.4	1.0	
Newton†	80	15	51.2	2.73		Hot Springs a	75	14	47.4	6.97		Keene*	71	12	38.6	9.0	
Oneonta	73	16	44.4	4.67	T.	Hot Springs b				7.87		Kennedy Gold Mine	64	22	40.2	1.71	
Opelika†	74	11	50.4	4.89		Jonesboro	66	12	42.8	9.25		Kernville				0.47	2.0
Oxanna†	71	13	46.0	3.00		Keesees Ferry†	72	10	42.8	3.57		King City*	72	19	44.2	0.54	
Pineapple	81	18	49.6	3.65		Lacrosse†	63	10	40.2	4.63		Kingsburg*	65	20	41.0	0.60	
Pushmataha†	78	17	52.4	3.55		Loneoke*	72	20	47.2	12.00		Kono Tayee	56	27	41.8	0.71	3.0
Riverton†	76	18	44.8	8.28		Luna Landing*	76	17	51.0	8.13		Lagrange*	63	25	42.1	0.99	
Rockmills†	74	13	50.3	3.18		Lutherville†	74	17	45.9			Laporte*†	55	10	27.9	2.53	25.5
Scottsboro†	78	18	45.2	4.61	1.8	Magnolia	79	19	51.3	8.37		Las Fuentes Ranch				0.75	
Selma†	80	17	50.8	2.04		Malvern†	74	16	44.2	9.37		Lemoore a*	62	16	40.0	0.28	
Sturdevant				2.67		Marianna*	70	20	48.4			Lick Observatory	62	17	35.7	2.30	8.0
Talladega*	74	16	49.4	3.62		Marvell	72	17	48.2	12.18		Limekiln	68	26	44.2		
Tallassee				2.12		Monticello	77	19	49.2	9.34		Lime Point L. H.				1.49	
Thomasville	85	15	47.2	3.13		Moore				9.48		Lodi	60	25	41.5	1.05	T.
Tuscaloosa†	76	18	49.8	6.65		Mossville	67	11	41.3	6.02		Los Alamos				1.50	
Tuscumbia	76	18	46.6	6.47		Mount Nebo†	64	17	41.8	4.52		Los Gatos b	59	31	43.2	1.57	
Union†	80	13	52.4	5.46		New Gascony*†	75	16	46.9	12.67		Lytton Springs	65	26	44.1	1.77	
Union Springs†	77	15	50.4	2.30		Newport a†				8.96		McMullin*	62	18	45.6		
Uniontown†				2.50		Newport b†	75	10	41.9	8.68		Malakoff Mine*†	70	18	37.5	2.28	8.0
Valleyhead	74	11	44.9	6.08	1.0	Newport c†	73	13	44.0	9.00		Mammoth Tank*	78	30	50.4	T.	
Warrior				6.97		Oregon*	68	12	39.0			Mare Island L. H.				1.58	
Wetumpka	78	16	50.4	2.12		Osceola	71	15	44.0	12.38		Merced*	64	28	41.4	0.86	
Wilsonville†				3.72		Ozark†	73	18	45.6	4.50		Mills College				1.42	
Arizona.						Picayune†	78	20	47.2	6.70		Milton (near)*†	65	27	44.2	1.22	
Arizona Canal Co. Dam.	76	25	48.6	2.13		Pinebluff†	76	18	48.8	14.50		Modesto*	74	25	45.9	0.49	
Benson*	67	17	45.8		5.0	Pocahontas†	72	12	41.6	6.07		Mohave*	70	16	37.8	0.60	6.0
Bisbee†	62	14	40.4	2.57	12.0	Powell*†	72	12	41.2	3.75		Mokelumne Hill*		26	38.5	1.62	
Buckeye†	83	18	48.3	1.70		Prescott				10.20		Monterey*	68	29	48.8	0.89	
Calabasas	70	14	41.9	1.81	3.5	Rison	76	16	48.2	11.30		Mount Frazier				0.95	4.0
Camp Creek	70	20	43.7	2.81	1.2	Russellville	71	16	43.1	4.65		Napa b.	64	24	43.2	1.22	
Casa Grande*	63	33	49.1	2.89		Silver Springs†	69	13	40.2	5.29	T.	Needles	73	26	47.8	0.35	
Cedar Springs	64	4	37.2	2.89	27.9	Spierlerville	71	17	44.0	3.80		Nevada City	62	15	36.5	1.92	4.0
Congress	72	23	43.8	1.94	4.0	Stamps	80	16	50.4	8.82		Newhall*	75	19	41.6	0.45	2.0
Dragon				3.22		Stuttgart†	74	16	46.4	13.10		North Ontario	80	26	46.2	2.20	
Dragon Summit*	64	13	40.8	0.81	3.0	Texarkana†	78	17	47.2	7.00		North San Juan*†	60	11	37.2	3.11	0.5
Dudleyville	68	21	41.9	2.80	6.0	Warren†	77	16	50.2	10.97		Oakland a	57	31	44.2	1.30	
Empire Ranch	62	4	37.6	2.94	21.0	Washington*†	76	22	48.6	8.75		Ogilby*	85	35	52.2	0.00	
Farleys Camp†	77	19	44.1	3													

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
California—Cont'd.						Colorado—Cont'd.						Florida—Cont'd.					
Rio Vista.....	61	24	42.0	1.26	.....	Millbrook.....	52	—45	15.2	0.95	12.5	Tallahassee.....	81	23	57.2	1.13	.....
Roe Island L. H.....	.....	.....	.....	1.25	.....	Minneapolis.....	80	—31.5	0.60	6.0	.....	83	22	59.2	0.18	.....
Rosewood.....	66	10	37.0	0.91	1.5	Moraine.....	51	—17	21.8	0.50	7.5	Wausau.....	78	17	55.1	1.15	.....
Sacramento.....	59	26	41.9	0.88	T.	Pagoda.....	45	—31	11.5	1.75	17.5	Georgia.					
Salinas.....	68	27	45.4	0.73	.....	Paonia.....	40	—36	4.0	0.48	7.0	Adairsville.....	73	18	44.0	4.95	0.3
Salton.....	78	30	49.1	0.45	.....	Parachute.....	47	—	0.26	3.0	.....	81	19	52.8	0.98	T.	
San Bernardino.....	82	24	46.7	2.10	.....	Rangely.....	40	—36	4.0	0.60	6.0	Albany.....	80	19	52.0	1.58	.....
San Jacinto.....	80	22	43.4	2.25	1.0	Redcliff.....	44	—19	17.1	1.13	14.7	Allentown.....	77	18	52.4	1.48	.....
San Leandro.....	70	34	48.7	1.33	.....	Rico.....	61	—10	27.4	0.40	3.4	Americus.....	78	16	52.4	1.25	.....
San Luis L. H.....	58	30	45.9	1.46	.....	Rockyford.....	61	—10	27.4	0.40	3.4	Athens.....	73	16	46.0	2.93	.....
San Mateo.....	63	17	42.4	0.25	.....	Ruby.....	40	—16	13.9	0.28	4.1	Belleville.....	77	19	54.7	0.33	.....
San Miguel.....	75	36	49.7	1.84	.....	Saguache.....	59	—21	22.9	0.50	7.5	Blakely.....	77	19	54.4	1.84	.....
San Miguel Island.....	75	36	49.7	1.84	.....	Salida.....	46	—30	11.2	1.20	12.0	Brag.....	84	18	54.3	0.23	.....
Santa Barbara.....	73	34	50.7	0.63	.....	San Luis.....	55	—12	23.4	2.97	33.0	Canton.....	73	16	47.6	3.87	T.
Santa Barbara L. H.....	70	36	46.0	1.28	.....	Santa Clara.....	70	—14	26.8	0.90	9.0	Cedartown.....	70	14	43.0	5.95	1.5
Santa Clara.....	70	36	46.0	2.17	.....	Seibert.....	70	—14	26.8	0.90	9.0	Clayton.....	75	20	51.0	2.54	.....
Santa Cruz.....	78	37	48.6	1.44	.....	Smoky Hill Mine.....	56	—12	17.9	0.91	12.0	Columbus.....	80	21	55.6	0.35	.....
Santa Cruz L. H.....	72	30	54.0	1.79	.....	Springfield.....	41	—36	8.2	0.36	5.0	Covington.....	70	12	44.7	3.86	T.
Santa Maria.....	77	24	47.4	0.92	.....	Stamford.....	46	—9	18.8	0.51	5.4	Crescent.....	71	12	44.0	5.64	1.0
Santa Monica.....	77	24	47.4	0.92	.....	Steamboat Springs.....	42	—34	5.0	1.02	15.0	Dahlonaga.....	73	15	47.2	2.90	T.
Santa Paula.....	65	24	47.3	1.81	.....	Strickler Tunnel.....	40	—34	11.1	0.30	3.0	Elberton.....	80	20	53.2	0.40	.....
Santa Rosa.....	79	30	48.9	1.63	.....	T. S. Ranch.....	42	—34	5.0	1.02	15.0	Fleming.....	78	19	53.7	1.56	.....
Saticoy.....	79	30	48.9	1.63	0.2	Wagon Wheel.....	40	—34	11.1	0.30	3.0	Fort Gaines.....	73	20	50.1	3.42	.....
Shasta.....	79	30	48.9	1.63	0.2	Walden.....	40	—34	11.1	0.30	3.0	Franklin.....	71	20	44.9	3.24	0.5
Sierra Madre.....	60	—16	24.6	0.85	8.0	Wallet.....	65	—2	28.9	0.06	0.5	Gillsville.....	73	15	46.2	1.26	.....
Sneddens Ranch.....	62	37	43.6	1.08	.....	Wray.....	65	—2	28.9	0.06	0.5	Greenbush.....	73	17	44.8	7.13	1.0
S. E. Farallone L. H.....	57	25	40.5	0.61	18.0	Yuma.....	65	—2	28.9	0.30	3.0	Hawkinsville.....	81	9	51.2	1.80	.....
Stanford University.....	62	37	43.6	1.08	.....	Connecticut.						Hephzibah.....	70	22	52.3	2.90	T.
Stockton.....	57	25	40.5	0.61	18.0	Canton.....	50	—15	25.0	4.97	26.5	Jesup.....	80	21	54.4	0.25	.....
Summerdale.....	62	7	31.6	2.60	6.5	Colchester.....	52	—3	27.8	4.83	25.0	Lagrange.....	75	16	50.2	2.74	T.
Susannah.....	44	9	24.6	0.45	6.5	Falls Village.....	50	—	4.58	4.58	22.2	Lawrenceville.....	68	19	47.0	2.44	0.5
Sutter Creek.....	60	16	35.8	0.92	.....	Greenfield Hill.....	50	—2	26.1	5.23	12.2	Louisville.....	79	17	52.4	1.63	.....
Tehama.....	62	25	41.2	0.55	.....	Hartford.....	50	—2	26.1	5.23	12.2	Lumpkin.....	75	17	52.5	1.40	.....
Templeton.....	60	21	37.6	0.90	0.5	Hartford.....	50	—2	26.1	5.23	17.0	Marietta.....	72	16	46.2	3.33	5.0
Trinidad L. H.....	46	—12	16.4	1.05	10.5	Lake Konomoc.....	56	—6	28.3	4.22	14.0	Marshallville.....	73	18	52.4	1.35	T.
Truckee.....	70	30	43.9	0.63	.....	Middletown.....	55	—2	28.4	4.45	12.5	Morgan.....	80	13	51.3	2.98	.....
Tulare.....	70	30	43.9	0.63	.....	New London.....	49	—8	25.1	7.43	.....	Mount Vernon.....	78	22	54.8	0.80	.....
Turlock.....	75	40	56.6	0.56	.....	North Grosvenor Dale.....	55	—7	29.0	4.32	14.0	Newnan.....	71	18	46.8	1.88	.....
Ukiah.....	62	12	40.0	1.23	3.0	Norwalk.....	50	—10	26.7	3.95	12.5	Piscataway.....	79	20	53.8	1.08	.....
Upper Mattole.....	68	30	44.4	3.84	.....	South Manchester.....	51	—7	25.2	4.70	16.2	Point Peter.....	72	14	47.7	3.10	T.
Vacaville.....	60	26	43.3	1.59	0.7	Storrs.....	51	—7	25.2	4.70	16.2	Poulan.....	83	15	53.5	1.81	.....
Ventura.....	79	25	47.6	1.54	.....	Voluntown.....	55	—4	28.5	4.66	14.0	Quitman.....	82	19	54.8	1.14	.....
Volcano Springs.....	80	30	52.0	T.	Waterbury.....	50	—4	28.6	5.09	23.5	Ramsey.....	74	16	46.9	5.19	T.	
West Palmdale.....	62	18	34.6	2.34	13.0	West Cornwall.....	46	—7	24.4	3.52	20.5	Resaca.....	73	18	45.7	5.05	1.4
Westpoint.....	56	24	39.9	0.85	.....	West Simsbury.....	50	—5	24.8	5.46	22.1	Reynolds.....	73	18	45.7	5.05	T.
Wheatland.....	61	37	43.1	0.35	2.0	Windor.....	50	—5	24.8	5.46	22.1	Rome.....	71	19	50.8	2.42	T.
Williams.....	85	37	58.6	0.66	.....	Delaware.						Talbotton.....	73	15	46.4	3.42	T.
Wilmington.....	68	22	40.4	1.17	.....	Dover.....	60	15	35.9	3.83	.....	Tallahassee.....	81	20	55.1	1.73	.....
Wire Bridge.....	49	10	31.6	0.83	.....	Millford.....	66	18	39.5	2.85	.....	Thomasville.....	71	15	44.6	4.68	1.0
Yerba Buena L. H.....	49	10	31.6	0.83	.....	Millsboro.....	65	15	37.4	2.65	.....	Toccoa.....	71	15	44.6	4.68	1.0
Yreka.....	46	28	38.2	0.66	.....	Newark.....	56	13	33.1	3.57	8.5	Washington.....	81	22	53.8	0.85	0.8
Yuba City.....	46	28	38.2	0.66	.....	Seaford.....	65	16	37.8	3.37	1.5	Waycross.....	81	22	53.8	0.85	.....
Colorado.						District of Columbia.						Whitesburg.....	73	15	46.4	3.42	T.
Altman.....	48	—10	18.0	0.43	7.5	Distributing Reservoir.....	57	18	36.7	3.31	.....	Idaho.					
Antlers.....	41	—10	20.0	0.24	4.5	Receiving Reservoir.....	57	18	36.6	3.70	.....	American Falls.....	44	—25	13.9	0.75	7.5
Arkins.....	67	5	30.7	0.43	7.0	West Washington.....	64	16	35.6	3.87	4.3	Blackfoot.....	50	—30	12.2	0.65	6.7
Boulder.....	67	5	30.7	0.43	7.0	Florida.						Boise Barracks.....	44	—8	22.2	1.40	12.5
Boxelder.....	56	—26	7.8	0.29	4.4	Archert.....	82	17	59.1	1.42	.....	Burnside.....	48	—22	15.0	0.64	16.0
Breckenridge.....	71	—14	31.8	0.56	7.2	Bartow.....	86	18	61.4	0.48	.....	Challis.....	60	—11	18.6	0.90	9.0
Canyon.....	48	—19	20.2	0.57	8.1	Boca Raton.....	84	33	67.3	0.34	.....	Coeur d'Alene.....	46	8	27.4	.....	.....
Cedaredge.....	69	0	28.9	0.25	2.5	Brooksville.....	82	23	61.0	0.61	.....	Corral.....	40	—25	9.1	1.80	18.0
Cheyenne Wells.....	69	0	28.9	0.25	2.5	Carrabelle.....	75	22	56.4	1.90	.....	Downey.....	40	—30	14.1	1.10	9.3
Colbran.....	65	—6	26.3	0.18	3.1	Clermont.....	77	18	55								

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.					
Aurora b.	49	— 1	25.8	Ins.	Ins.
Bloomington†	55	6	29.6	4.00	12.0
Bushnell†	50	5	30.1	3.58	13.5
Cambridge	43	5	27.4	3.34	23.6
Carlinville†	58	5	33.4	4.98	8.0
Carlyle				3.98	
Carrollton	53	4	32.2	5.10	3.5
Charleston	61	3	32.8	4.44	1.2
Chemung	41	0	22.4	2.89	33.0
Chester				3.93	0.1
Cisnet	70	8	36.4	5.06	1.0
Clearcreek†	55	0	27.0	4.00	18.0
Coatsburg	50	3	29.6	3.71	11.8
Cobden†	68	7	39.6	4.20	0.1
Cordova	45	0	23.4	3.62	28.0
Danville	64	6	32.0	3.66	0.2
Decatur†	60	4	32.0	5.18	7.0
Dixon†	42	1	24.8	3.27	23.5
Dwight†	55	4	27.8	3.80	8.5
East Peoria†	51	4	28.7	4.61	9.5
Edingham†	67	2	34.6	4.57	3.5
Elgin	46	2	25.5		20.7
Fort Sheridan†	48	2	25.8	2.59	18.6
Friendgrove†				6.35	1.1
Galva†	47	1	26.5	3.38	18.6
Glenwood*††	60	2	28.7	3.16	20.0
Golconda†	69	8	40.8	7.03	
Grafton†				5.90	1.0
Grayville	64	12	41.1	7.11	1.0
Greenville†	57	3	32.6	3.97	2.0
Griggsville†	54	6	31.8	4.46	
Halliday*	64	11	39.0	4.03	T.
Havana†	55	7	32.6	4.64	12.0
Hillsboro†	61	4	33.6	5.51	3.0
Iron	68	12	36.5	4.62	T.
Joliet†	60	4	29.1	4.05	18.0
Jordans Grovet.	64	6	37.8	3.83	0.2
Kishwaukee.	42	— 1	23.1	2.00	
Knoxville a.	48	0	27.2	5.30	19.0
Lagrange†	55	5	29.7	4.30	21.0
Laharpe	47	4	27.4	2.94	18.5
Lanark†	44	— 2	22.8	1.85	
Lexington	57	2	29.1	4.62	7.0
Loami†				5.25	6.5
Louisville†	68	3	35.8	4.86	0.8
McLeansboro†	67	10	37.9	4.98	T.
Martinsville†	69	5	34.0	3.86	
Martinton†	62	6	29.6	3.44	3.5
Mascoutah	64	3	35.1	4.03	0.5
Mattoon	63	2	31.7	3.34	
Minonk†	54	— 2	27.1	4.21	14.5
Monmouth†	47	1	27.0	3.30	23.2
Morrisonville†	59	6	32.6	5.02	2.8
Mount Carmel†				6.53	0.4
Mount Pulaski	57	6	32.5	4.78	8.5
Mount Vernon	70	9	35.8	5.86	1.0
New Burnside†	68	8	40.4	4.67	T.
Olney a.	65	7	36.1	5.22	1.0
Osage*	46	1	24.8	3.86	16.2
Ottawa†	55	3	27.0	5.24	22.5
Palestine†	67	8	36.1	5.33	1.0
Paris	66	5	34.5	4.29	0.3
Peoria a†				4.39	13.9
Peoria b†	56	7	30.6	4.08	9.5
Phil†	64	5	31.8	3.62	5.0
Plumhill†	65	5	37.0	4.79	0.4
Rantoul†	61	4	30.2	3.46	5.8
Reynolds	43	1	25.9	2.70	16.8
Riley†	44	2	24.1	3.89	24.7
Robinson†	69	6	34.8	5.30	0.5
Rockford	40	3	22.2	2.97	26.0
Roundgrove†	44	1	24.6	3.01	30.9
St. Charles*††	48	4	26.3	3.73	18.5
St. John†				4.07	
Scales Mound	42	8	22.0	2.17	17.5
Streator†	56	6	29.6	3.43	15.2
Sycamore†	47	1	24.2	3.38	19.2
Tiskilwa†	43	1	26.2	3.76	26.0
Tuscola†	65	4	31.8	4.49	0.5
Walnut†	50	3	27.6	3.96	27.1
Wheaton*				3.67	24.2
Winchester*	59	6	31.4	5.75	8.5
Winnebago†	42	3	24.0	2.95	22.0
Zion†	42	— 1	24.9	3.95	29.5
Indiana.					
Anderson†	65	3	32.8	4.11	2.8
Angola*	61	6	28.7	3.73	11.1
Auburn	64	5	29.6	3.28	
Bloomington†	66	5	33.9	6.42	T.
Bluffton†	64	5	30.2	3.21	3.8
Boonville	69	14	40.0	7.91	0.3
Bright†	67	5	35.0	7.38	1.0
Butterville†	66	7	35.0	9.28	1.7
Cambridge City†	65	2	32.2	5.95	1.9
Columbia City*	62	4	29.0	3.89	4.0
Columbus†	66	1	33.5	6.30	
Indiana—Cont'd.					
Connersville†	65	0	31.5	5.47	0.5
Crawfordsville	62	7	36.4	3.40	1.1
Delphi†	67	4	30.6	3.26	0.8
Edwardsville*††	69	14	38.9	8.84	0.2
Farmland†	64	5	32.7	5.16	3.0
Fort Wayne	64	7	31.1	3.92	6.0
Franklin*	66	10	34.4	5.45	0.5
Greencastle†	65	9	32.8	7.98	2.0
Hammond†	58	7	28.1	2.41	16.0
Hector	63	13	30.8	5.07	0.5
Huntington	65	4	30.7	4.18	9.0
Jasper†	67	13	38.9	9.25	
Jeffersonville	67	17	39.3	9.04	T.
Knightstown†	64	2	31.7	4.94	1.5
Knox	54	0	29.2	2.70	16.0
Kokomo†	65	7	33.0	4.99	1.6
Lafayette†	66	6	32.1	3.57	0.2
Laporte	56	1	26.8	3.53	11.3
Logansport b.†	65	5	29.4		
Madison	68	9	37.1	9.30	4.5
Marengo†	67	14	37.9	8.91	0.4
Marion†	65	4	32.2	3.89	3.0
Markle	64			3.50	6.0
Mauzy†	63	0	31.8	5.70	2.8
Michigan City*†	60	11	28.5		
Mount Vernon†	66	13	38.5	5.84	
Northfield†	65	0	31.4	4.30	1.0
Princeton*	67	12	38.7	1.36	1.0
Richmond	65	2	32.0	4.83	
Rockport	70	14	41.8	7.30	0.6
Rockville†	66	4	33.2	4.18	T.
Salem	66	0	36.2	6.95	
Scottsburg	68	10	37.2	8.23	1.0
Seymour	67	15	35.4	8.47	T.
Shelbyville	65	6	32.2	5.97	1.5
South Bend†	60	0	29.1	3.52	18.5
Syracuse†				3.48	7.0
Terre Haute†	67	7	33.9	4.48	T.
Topeka†	61	5	28.9	2.45	7.0
Valparaiso†	60	4	27.0	1.92	8.7
Vevay	68	11	38.8	11.60	
Vincennes	67	10	35.6	6.13	
Warsaw†	65	3	28.5	1.90	
Washington†	66	14	38.2	6.13	
Winamac	65	10	31.9	3.45	1.5
Worthington†	67	10	35.7	5.24	0.6
Indian Territory.					
Healdton†	75	14	44.9	2.29	T.
Kemp	76	19	48.4	2.90	
Lehigh†	74	11	43.8	3.64	
South McAlester†				3.96	
Tahlequah	70	13	41.8	5.86	
Tulsa†				4.62	
Wagoner	72	13	41.7	4.62	
Iowa.					
Adair				0.90	9.0
Afton	42	1	26.1	1.75	12.0
Albia	50	3	29.2	2.93	12.0
Algona*	37	3	21.1	0.25	2.5
Alta a†	38	1	21.6	0.25	2.5
Amana†	41	1	23.0	19.9	17.2
Ames b.	42	0	22.8	0.46	4.7
Ames (near)				0.80	7.0
Atlantic†	43	8	23.2	1.48	14.5
Audubon	43	5	22.8	1.10	11.0
Belknap	47	1	26.4	5.00	38.0
Belleplaine	42	7	20.5	3.32	26.5
Bonaparte†	47	2	26.2	3.33	22.0
Britt	39	8	19.2	0.25	1.8
Burlington	43	4	28.3	1.86	11.5
Carroll	42	4	22.4	1.30	12.0
Cedarfalls	40	5	22.3	1.90	
Cedar Rapids†	43	11	22.4	1.02	19.9
Chariton	45	3	27.2	3.49	22.4
Charles City	40	9	21.5	1.30	4.0
Clarinda†	46	7	28.2	1.42	12.2
Clinton	45	1	25.0	3.60	21.8
College Springs	43	1	27.0	1.01	9.5
Corning†	48	3	27.4	1.50	14.0
Council Bluffs	45	1	27.0	0.18	
Cresco†	38	10	19.8	0.55	1.5
Decorah†	41	7	20.0	0.82	
Delaware*	43	1	19.7	1.42	9.0
Denison†	50	4	25.2	0.60	6.0
Desoto	43	1	25.2	1.81	15.0
Dows	36	10	19.0	0.85	5.0
Eldora	40	11	23.0	2.30	23.0
Elkader†	47	4	22.6	0.88	6.8
Estherville	43	6	21.7	0.15	1.5
Fairfield†	46	2	26.4	3.52	23.5
Fayette†	43	6	20.7	1.63	4.6
Forest City	39	4	20.0	0.30	3.0
Fort Madison*††	44	7	30.2	3.78	20.5
Fredericksburg				0.78	
Galva	39	3	22.0	0.18	
Glenwood†	47	1	26.4	1.40	14.0
Iowa—Cont'd.					
Grand Meadow*	38	4	21.4	0.90	6.0
Greene	40	9	21.0	0.47	10.0
Greenfield	50	0	26.3	1.53	15.0
Grinnell	44	5	24.5	3.19	
Grundy Center	40	6	20.7	1.80	18.0
Guthrie Center	43	0	24.2	1.06	6.8
Hampton	39				

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Kansas—Cont'd.						Kentucky—Cont'd.						Maryland—Cont'd.					
Fallriver	75	12	36.6	3.66	5.5	Scott	66	9	36.6	8.75	0.5	Westernport	65	8	33.8	4.73	4.8
Fanning	54	—2	29.0	2.22	12.0	Sergeant	68	13	38.2	5.85	1.3	Westminster	58	8	34.2	4.06	8.5
Fort Riley †	59	4	30.6	0.83	8.3	Shelby City	68	9	38.2	9.55	1.0	Woodstock	60	14	34.9	2.58	4.4
Fort Scott †	70	13	36.4	4.18	...	Shelbyville †	68	9	38.2	8.80	7.0	Massachusetts.					
Frankfort	55	2	30.0	1.65	15.5	Southfork	68	6	40.7	6.80	...	Adams	51	—11	22.8	...	26.0
Garden City †	65	3	29.4	1.35	8.0	Vanceburg	68	6	36.8	6.05	...	Amherst	50	—14	23.4	5.85	25.2
Garfield	71	0	29.6	0.57	7.2	Williamsburg †	69	16	42.4	8.97	3.0	Attleboro	47	—6	23.4	3.21	...
Gibson	67	3	30.8	0.40	4.0	Louisiana.						Bedford	51	—5	25.5	5.32	26.0
Gove †	60	11	35.6	0.45	4.5	Abbeville	82	24	57.4	8.10	...	Bluehill (summit)	57	—8	26.7	4.24	27.0
Grainfield †	73	8	35.1	3.34	3.0	Alexandria †	80	19	53.2	6.62	...	Cambridge a	57	—8	26.7	4.07	...
Grenola	58	2	30.0	1.40	12.0	Amite †	82	19	56.0	6.94	...	Chestnut Hill	53	—9	26.8	5.60	23.0
Halstead	55	6	30.2	1.85	18.5	Bastrop †	81	19	53.4	7.67	...	Clinton	52	—11	25.1	...	...
Horton	66	0	28.2	0.08	0.8	Baton Rouge †	84	22	56.5	6.06	...	Cohasset	53	—15	23.4	3.26	...
Hoxie	70	5	35.0	1.47	13.8	Cheneyville †	83	26	54.6	7.26	...	Concord	53	—15	23.4	4.50	23.6
Hutchinson	71	15	37.3	4.56	3.5	Clinton †	79	19	56.2	10.32	...	Dudley †	45	—5	24.9	2.62	22.2
Independence	62	8	32.0	4.01	17.0	Emile †	75	22	55.8	3.54	...	East Templeton †	42	—8	22.4	4.31	23.0
Lakin †	61	6	32.2	3.01	11.5	Farmerville	78	18	50.6	9.00	...	Fallriver	52	0	28.4	4.67	11.8
Lawrence †	58	5	29.2	0.70	7.0	Franklin †	78	22	56.6	5.73	...	Fiskdale	49	—11	23.0	3.49	13.5
Lebo †	59	8	31.2	1.77	...	Grand Coteau	78	26	56.8	7.11	...	Fitchburg a	45	—6	23.5	5.18	27.5
Macksville	58	10	31.4	0.97	6.0	Hammond	82	19	56.2	5.67	...	Fitchburg b	49	—11	23.0	5.52	27.5
McPherson	58	10	31.8	1.03	9.7	Houma	80	23	59.6	4.78	...	Framingham	53	—14	25.9	6.54	...
Manhattan b	60	10	31.8	1.03	9.7	Jeanerette	81	18	57.0	7.47	...	Groton	50	—14	22.2	5.67	32.0
Manhattan c	60	10	31.8	1.03	9.7	Jennings	83	28	57.2	8.01	...	Hadley	49	—20	20.6	...	...
Marion †	57	9	33.0	1.50	9.0	Lafayette †	78	21	58.2	...	...	Hyannis †	52	5	29.9	4.81	7.0
Mead †	65	9	34.6	0.78	6.5	Lake Charles †	79	24	56.6	6.83	...	Jefferson	51	—13	24.8	6.74	37.5
Medicine Lodge †	59	3	30.0	1.26	12.6	Lawrence	79	25	60.8	1.50	...	Lawrence	48	—8	22.5	4.71	20.2
Minneapolis †	70	5	34.4	3.76	10.0	Liberty Hill	81	17	52.9	8.40	...	Leicester Hill	50	—14	25.9	5.75	29.8
Morantown †	68	2	30.4	0.41	4.1	Melville	80	19	55.5	8.25	...	Leominster	50	—14	22.2	5.67	32.0
Morland	64	8	33.3	1.90	9.0	Minden	81	17	51.0	7.79	...	Long Plain	50	—14	24.0	4.52	...
Mouthhope †	61	9	33.2	0.56	9.0	Monroe †	79	19	52.2	6.93	...	Lowell a	51	—16	24.1	...	...
Ness City	61	6	33.4	1.79	...	Montgomery	80	18	51.2	6.31	...	Lowell b	54	—9	26.3	...	...
Newton	59	2	29.5	0.19	1.9	New Iberia	74	24	55.2	8.70	...	Lowell c	45	—19	19.2	6.12	24.0
Norton	65	14	35.6	1.73	8.0	Oakridge †	81	21	52.0	12.25	...	Ludlow	54	—15	25.9	4.55	19.0
Norwich	57	5	32.2	4.75	16.0	Opelousas	81	19	57.9	6.17	...	Mansfield †	56	—7	27.3	4.78	7.5
Olathe †	61	3	32.6	2.35	12.0	Paincourtville †	83	21	58.4	4.91	...	Middleboro	52	—14	25.2	5.26	28.0
Osage City †	75	14	40.0	4.95	5.0	Plain Dealing †	76	17	50.6	8.10	...	Monson	55	0	30.3	5.78	6.5
Osborne	62	9	32.6	3.76	11.4	Plaquemine	84	22	57.8	6.75	...	Mount Nonotuck	55	—1	29.3	5.50	4.4
Oswego	64	4	30.6	1.20	12.0	Rayne	79	20	56.6	8.71	...	New Bedford a	46	—8	22.0	5.06	34.0
Ottawa	69	1	28.6	1.41	14.0	Robeline	78	13	52.4	4.98	...	New Bedford b	47	—8	22.2	5.80	32.5
Paola	62	2	34.1	0.65	6.5	Ruston	77	23	52.2	8.16	...	New Salem	50	—14	24.0	4.52	...
Phillipsburg	69	1	29.8	1.71	12.0	Schriever	84	21	56.6	4.38	...	Pittsfield	46	—8	22.2	5.80	32.5
Pleasant Dale	62	2	34.1	0.65	6.5	Shellbeach	76	28	59.2	5.55	...	Plymouth	50	—14	24.0	4.52	...
Pratt	63	10	36.3	2.02	4.0	Southern University †	80	23	56.0	2.82	...	Princeton	54	6	30.6	3.60	16.0
Rome †	68	1	29.8	1.71	12.0	Sugar Ex. Station †	78	25	56.2	3.51	...	Provincetown	58	0	29.9	5.02	23.0
Russell	61	1	29.8	1.71	12.0	Sugartown †	75	24	54.8	7.03	...	Salem	50	—14	24.0	4.52	...
Salina †	71	12	36.6	4.97	3.5	Venice †	78	28	58.2	0.85	...	Somerset †	52	—8	25.8	7.38	44.8
Sedan †	57	0	30.0	1.86	15.5	Wallace	81	26	57.6	4.60	...	South Clinton	52	—8	25.8	4.42	19.5
Seneca	85	10	34.0	0.20	2.0	Whitehall	84	22	57.4	4.60	...	Springfield Armory	52	—8	25.8	6.96	40.2
Sharon Springs †	74	4	34.6	3.15	7.0	White Sulphur Springs	87	16	56.9	9.17	...	Sterling	52	—5	26.2	4.34	8.0
Toronto	68	1	31.9	0.80	8.0	Maine.						Taunton c	54	—10	26.8	6.14	...
Ulysses †	68	1	31.9	0.80	8.0	Bar Harbor	48	—13	19.6	6.45	30.5	Turners Falls	49	—12	21.4	5.79	...
Viroqua †	60	10	29.7	1.55	15.4	Belfast †	38	—17	17.5	5.81	36.0	Webster	48	—15	25.1	4.71	14.2
Wallace	64	18	38.8	2.31	4.0	Calais	37	—27	15.6	5.42	35.0	Westboro †	52	—12	25.8	5.19	27.7
Wellington †	66	10	34.7	0.10	1.0	Cumberland Mills	42	—17	20.6	5.34	36.3	Winchendon	52	—12	25.8	4.88	27.5
Winona †	66	10	34.7	0.10	1.0	Fairfield	40	—31	14.6	5.07	31.5	Worcester a	52	—5	25.6	3.77	...
Kentucky.						Flagstaff	35	—39	9.6	4.80	43.0	Worcester b	51	—5	25.8	4.28	21.0
Alpha †	72	11	38.4	7.55	...	Gardiner	41	—30	16.2	5.54	38.0	Michigan.					
Ashland	70	12	38.8	9.46	...	Kineo †	35	—30	9.6	4.24	45.0	Adrian	61	2	27.0	3.14	8.5
Bardonia †	68	8	40.4	8.37	0.5	Lexington	40	—24	17.5	5.93	41.0	Agricultural College	54	—6	24.9	3.07	12.2
Blandville †	69	15	41.3	11.99	1.5	North Bridgton	40	—21	17.0	5.76	42.0	Allegan	56	9	27.1	2.40	16.0
Bowling Green †	66	7	35.6	8.98	2.0	Orono	41	—30	13.4	6.32	42.0	Alma	40	—10	24.0	3.80	24.5
Burnside †	68	15	43.6	7.46	0.5	Petit Menan †	38	0	21.4	...	...	Ann Arbor					

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.							
Maximum.		Minimum.		Mean.		Rain and melted snow.	Total depth of snow.	Maximum.		Minimum.		Mean.		Rain and melted snow.	Total depth of snow.	Maximum.		Minimum.		Mean.		Rain and melted snow.	Total depth of snow.						
Stations.								Stations.								Stations.													
Michigan—Cont'd.						Minnesota—Cont'd.						Missouri—Cont'd.																	
Grayling.....	38	-12	19.7	3.49	35.5	Long Prairie.....	38	-11	16.6	0.02	0.2	Brunswick.....	58	8	30.8	4.05	13.0												
Hanover.....	60	0	36.6	2.65	13.8	Lutsen.....	37	-9	16.9	0.19	1.9	Carrington.....	58	11	32.8	3.41	19.0												
Harrisville.....	40	-8	22.2	3.45	34.5	Laverne.....	49	-6	22.4	0.25	2.0	Conception.....	51	9	30.0	3.47	29.0												
Hart.....	45	-8	36.5	4.89	45.0	Lynd.....	42	-9	20.3	T.	T.	Cowgill.....	54	2	31.3	5.00	21.5												
Hastings.....	57	-1	36.8	3.02	17.5	Mapleplain.....	42	-9	20.3	0.05	0.4	Darksville.....	58	6	30.7	4.82	11.0												
Hayes.....	38	-13	25.0	1.84	9.0	Maplewood.....	41	0	23.4	0.00	0.0	Downing.....	58	6	30.7	4.13	26.5												
Highland Station.....	38	-13	25.0	1.84	9.0	Milaca.....	44	-7	18.8	0.00	0.0	East Lynne.....	58	10	33.8	4.62	9.0												
Hillsdale.....	60	6	36.8	3.93	11.5	Milant.....	44	-10	19.5	T.	T.	Edgehill.....	58	6	36.4	3.69	0.0												
Howell.....	58	0	39.8	2.84	4.0	Minneapolis.....	42	-5	21.5	0.08	0.8	Eightmile.....	62	8	33.7	4.76	9.8												
Humboldt.....	34	-19	13.2	0.73	2.5	Minneapolis.....	41	-6	20.5	0.05	0.5	Eldon.....	62	7	36.6	3.72	1.0												
Iron River.....	42	-7	14.9	0.47	4.0	Minnesota City.....	42	-6	21.5	0.07	6.5	Elmira.....	60	1	29.2	4.80	15.5												
Ivan.....	40	-1	32.8	5.00	41.5	Montevideo.....	44	-6	21.5	T.	T.	Fairport.....	58	6	30.7	3.94	28.0												
Jackson.....	59	4	37.6	2.73	5.0	Morris.....	41	-8	20.0	0.01	0.2	Farmersville.....	58	6	30.7	4.05	23.0												
Jeddo.....	48	-3	24.6	2.83	17.2	Mount Iron.....	35	-26	10.5	1.05	10.5	Fayette.....	63	8	34.9	4.41	10.0												
Kalamazoo.....	58	7	38.4	3.09	9.5	Newfolden.....	36	-28	6.0	0.25	2.5	Fulton.....	55	8	34.9	4.14	2.0												
Lake City.....	36	-1	21.5	4.16	34.0	New London.....	45	-6	19.3	0.00	0.0	Gallatin.....	55	6	30.0	5.13	28.0												
Lansing.....	55	-4	36.0	3.04	16.6	New Richmond.....	38	-8	18.1	0.00	0.0	Glasgow.....	62	7	32.8	4.66	16.0												
Lapeer.....	53	-16	25.3	2.04	13.4	New Ulm.....	43	-6	22.3	0.08	1.5	Gordonville.....	62	11	36.8	5.53	0.8												
Lathrop.....	37	-14	16.7	0.50	5.0	Park Rapids.....	37	-21	14.0	0.12	1.2	Gorin.....	66	12	37.1	4.37	30.8												
Ludington.....	41	12	26.8	3.95	18.6	Pine River.....	38	-31	14.0	0.04	0.4	Halfway.....	66	12	37.1	2.80	0.5												
Luzerne.....	39	-24	10.0	3.82	32.8	Pleasant Mounds.....	45	-3	22.5	0.07	1.0	Harrisonville.....	63	6	32.2	3.87	8.2												
Mackinaw City.....	42	-14	19.6	1.40	14.0	Pokegama Falls.....	40	-32	9.5	0.37	5.1	Hermann.....	67	5	39.3	3.49	0.2												
Madison.....	60	4	37.4	3.90	13.8	Redwing.....	40	-32	9.5	0.32	3.2	Houston.....	67	5	39.3	1.98	0.0												
Mancelona.....	39	-10	22.4	3.07	30.0	Rolling Green.....	45	-5	21.2	0.30	3.0	Houstonia.....	66	12	37.8	4.59	13.6												
Manistee.....	40	-5	26.6	5.30	40.0	Roseau.....	38	-31	4.9	0.32	2.9	Humansville.....	66	12	37.8	3.93	T.												
Manistique.....	36	-6	21.3	1.09	10.5	St. Charles.....	43	-7	19.0	0.87	8.5	Irena.....	67	2	38.0	3.24	24.2												
Marquette.....	38	-7	27.3	3.73	30.0	St. Cloud.....	38	-15	17.6	T.	T.	Ironton.....	67	2	38.0	4.29	T.												
Midland.....	41	0	23.6	2.80	30.0	St. Olaf.....	38	-9	17.2	0.04	0.8	Jefferson City.....	61	10	36.6	4.61	0.0												
Mottville.....	62	2	36.8	3.53	13.2	St. Peter.....	45	-2	23.8	0.10	1.0	Kidder.....	55	0	28.2	4.73	27.1												
Mount Clemens.....	55	2	25.4	2.99	5.8	Sandy Lake Dam.....	36	-25	13.3	0.12	2.0	Lamar.....	75	16	37.8	3.76	5.5												
Mount Pleasant.....	38	-13	22.0	3.71	35.4	Sauk Center.....	39	-9	17.1	T.	T.	Lamonte.....	63	9	38.0	3.96	14.0												
Muskegon.....	41	10	27.0	2.60	22.0	Shakopee.....	40	-4	22.8	T.	T.	Lebanon.....	63	9	38.0	3.33	0.5												
Newberry.....	38	-10	15.8	1.25	12.2	Spring Park.....	40	-36	8.8	0.05	0.5	Lexington.....	59	11	32.0	4.28	15.0												
North Marshall.....	57	4	25.6	4.11	10.7	Tower.....	40	-36	8.8	0.80	8.0	Liberty.....	59	5	31.3	5.92	21.0												
Northport.....	47	1	26.2	2.35	24.0	Wabasha.....	40	-3	30.8	0.26	3.0	Louisiana.....	56	5	33.2	3.85	5.0												
Old Mission.....	41	3	25.8	3.41	34.1	Willmar.....	41	-5	20.4	T.	T.	McCune.....	56	3	33.2	4.74	8.0												
Olivet.....	57	7	27.0	3.07	13.8	Worthington.....	40	-21	30.4	0.15	1.8	Mansfield.....	68	2	38.8	3.70	0.1												
Omer.....	39	-19	20.2	3.23	18.5	Zumbrota.....	42	-8	21.2	T.	T.	Marblehill.....	68	2	38.8	4.64	0.5												
Ovid.....	48	0	23.4	2.77	18.0	Mississippi.						Marshall.....	60	8	32.1	4.02	13.0												
Owosso.....	50	-3	23.4	3.91	21.0	Agricultural College.....	76	16	48.4	7.87	T.	Maryville.....	48	5	33.5	2.98	17.5												
Parkville.....	42	0	28.5	3.55	18.0	Austin.....	71	13	48.5	13.58	T.	Mexico.....	57	5	33.5	3.70	6.5												
Pentwater.....	42	0	28.5	3.55	18.0	Batesville.....	76	14	47.0	6.32	T.	Mineralspring.....	66	12	38.3	3.16	T.												
Petoskey.....	40	-4	22.5	3.22	34.0	Bay St. Louis.....	72	19	53.8	3.72	T.	Montreal.....	62	2	37.3	3.87	1.0												
Plymouth.....	55	-2	26.0	3.10	6.0	Biloxi.....	71	23	54.2	4.18	T.	Mount Vernon.....	70	15	40.1	4.45	T.												
Port Austin.....	39	-9	24.4	2.83	20.0	Booneville.....	75	12	45.9	7.51	T.	Neosho.....	70	14	39.4	3.44	T.												
Reed City.....	40	-14	17.6	2.85	23.0	Briers.....	78	22	54.3	8.58	T.	Nevada.....	70	13	36.3	4.78	5.5												
Rockland.....	45	-5	18.2	1.65	16.6	Brookhaven.....	80	15	53.3	9.05	T.	New Haven.....	58	9	38.1	3.36	0.1												
Rogers City.....	42	-5	22.2	4.88	38.0	Canton.....	78	21	53.1	6.88	T.	New Palestine.....	67	10	37.6	3.08	3.0												
Romeo.....	47	-2	24.7	1.90	15.0	Columbus.....	79	15	49.2	7.75	T.	Oakfield.....	60	4	36.2	3.95	2.0												
Saginaw.....	41	-4	25.0	4.50	19.5	Columbus.....	79	15	49.2	7.75	T.	Oakmount.....	60	4	36.2	3.95	2.0												
St. Ignace.....	39	-7	19.5	1.72	11.0	Corinth.....	75	13	46.4	8.44	T.	Oakridge.....	60	4	36.2	3.95	2.0												
St. Johns.....	51	0	36.9	2.95	14.5	Crystal Springs.....	80	18	52.6	8.76	T.	Olden.....	68	7	37.6	3.48	T.												
Sandbeach.....	45	0	24.0	1.80	3.8	Edwards.....	78	19	52.8	8.18	T.	Oregon.....	52	6	29.8	3.62	27.4												
Sidnaw.....	40	-12	17.2	1.05	10.5	Fayette.....	78	19	52.8	8.18	T.	Oregon.....	56	6	31.0	3.28	23.1												
Somerset.....	59	-4	26.0	3.29	15.0	French Camps.....	78	10	48.5	7.57	T.	Osceola.....	6																

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.							
Stations.						Stations.		Stations.						Stations.		Stations.						Stations.							
Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.							
Montana—Cont'd.						Nebraska—Cont'd.						Nevada—Cont'd.						New Hampshire.						New Jersey.					
Glasgow.....	40	-15	15.8	0.20	1.0	McCook.....	.....	.....	0.20	2.0		Reno*.....	46	-4	23.4	.....	5.5									
Glenview.....	43	-7	22.1	0.20	2.0	McCool.....	.....	.....	0.40	4.0		Reno State University..	53	-6	22.2	.....	0.99	10.4								
Glenwood.....	41	-7	20.9	0.94	9.3	Madison.....	.....	.....	0.60	6.0		Ruby Valley.....	51	.....	.....	.....	0.41	7.2						
Greatfalls.....	64	0	30.7	0.28	2.8	Madrid*.....	60	-3	26.6	0.75	7.5	St. Clair.....	51	1	21.0	.....	0.49	8.1										
Kallisell.....	40	-8	20.1	0.60	6.0	Marquette.....	.....	.....	0.47	4.8		St. Thomas.....	66	10	34.3	.....	1.00	.....										
Kipp.....	47	-18	23.8	0.27	2.7	Merriman.....	.....	.....	0.40	4.0		San Antonio.....	56	-5	22.2	.....	0.11	1.0								
Lewistown.....	49	-9	24.4	0.55	5.0	Minden a.....	55	2	28.5	0.31	1.9	Silverpeak.....	55	-4	25.0	.....	0.24	5.0										
Livingston.....	45	-4	24.5	T.	T.	Minden b.....	.....	.....	0.25	.....		Sodaville.....	59	3	25.2	.....	0.23	2.5							
Manhattan.....	44	-18	15.6	0.25	2.5	Monroe.....	.....	.....	0.31	.....		Tecoma*.....	43	-10	13.4	.....	0.31	3.5							
Martinsdale.....	45	-10	23.6	0.40	4.0	Nebraska City b.....	.....	.....	1.67	16.5		Toano*.....	46	-16	13.3	.....	1.39	15.0								
Marysville.....	42	-4	20.4	0.46	4.6	Nebraska City c.....	47	0	24.6	1.30	13.0	Tybo.....	44	-5	20.2	.....	0.78	12.0										
Parrot.....	49	-5	21.8	1.00	10.0	Nemaha*.....	44	-2	26.7	1.95	17.0	Verdi*.....	48	-4	28.4	.....	.....	.....								
Poplar.....	40	-9	18.6	T.	T.	Nesbit.....	54	-5	25.6	1.55	15.0	Wadsworth*.....	44	-8	19.3	.....	0.83	9.0										
Radersburg.....	49	-10	23.4	0.25	2.5	Norfolk a.....	44	-2	25.6	0.30	3.0	Wells.....	35	-28	13.5	.....	11.5	.....										
St Ignatius Mission.....	43	-2	26.2	0.81	10.2	Norfolk b.....	45	-2	25.2	0.69	6.8	New Hampshire.																	
St. Pauls.....	48	-10	24.5	0.60	6.0	Norman.....	.....	.....	0.95	9.5		Alstead.....	38	-14	17.8	.....	5.19	28.9								
Troy.....	42	-5	24.6	0.70	7.0	North Loup.....	52	-6	26.4	0.55	5.5	Berlin Mills.....	44	-35	13.4	.....	2.62	27.5										
Utica.....	45	-4	23.2	0.70	7.0	Oakdale.....	46	-6	24.8	0.55	6.0	Bethlehem.....	48	-19	15.2	.....	2.85	26.5										
Virginia City.....	41	-8	18.8	0.74	7.5	Odell*.....	52	-2	29.6	1.50	15.0	Brookline*.....	48	-15	23.2	.....	3.82	55.5										
Wibaux.....	44	-10	21.9	T.	T.	O'Neill.....	45	-1	24.5	0.38	4.0	Claremont.....	42	-15	17.8	.....	5.25	51.0										
Yale.....	71	-8	24.2	0.30	3.0	Ord.....	50	-5	26.7	0.60	7.0	Concord.....	50	-24	19.6	.....	4.94	33.7										
Nebraska.						Osceola.....	.....	.....	0.05	0.5		Durham.....	50	-14	21.4	.....	3.59	32.0								
Agee*.....	48	4	26.0	0.65	6.5	Ough.....	.....	.....	0.20	2.0		Grafton.....	46	-25	16.8	.....	4.34	35.5								
Albion.....	49	-2	26.5	0.60	6.0	Palmer b.....	.....	.....	0.40	4.0		Hanover.....	42	-19	15.5	.....	4.89	43.3								
Alliance*.....	50	-12	19.9	1.14	15.5	Plattsmouth*.....	44	10	30.1	0.85	8.5	Keene.....	48	-23	19.4	.....	4.68	25.0										
Alma*.....	70	0	31.5	0.19	2.0	Ravenna a.....	54	-2	29.2	0.33	3.2	Lancaster.....	40	-32	12.8	.....	3.69	32.0										
Ansley.....	56	-6	26.4	0.35	3.5	Redcloud a.....	.....	.....	0.52	7.0		Littleton.....	46	-17	18.1	.....	4.42	22.5								
Arapahoe*.....	58	0	26.1	0.30	3.0	Redcloud b*.....	54	-9	29.7	0.45	4.5	Nashua.....	50	-18	22.0	.....	5.84	37.0										
Arborsville*.....	50	6	29.0	0.55	5.5	Republican*.....	52	2	28.5	0.10	1.0	Newton.....	50	-14	22.0	.....	6.12	43.0										
Ashland a.....	46	2	27.8	0.31	3.5	Rulo*.....	54	9	32.2	2.75	17.0	North Conway.....	44	-23	16.0	.....	6.00	51.0										
Ashland b*.....	44	8	29.8	0.54	4.2	St. Libory.....	51	0	29.6	0.38	3.8	Peterboro.....	46	-22	18.4	.....	6.82	48.6										
Ashton.....	51	-1	27.2	0.28	4.5	St. Paul.....	48	6	30.6	6.56	5.5	Plymouth.....	47	-28	15.6	.....	5.38	49.9										
Auburn*.....	51	-2	28.9	1.45	14.6	Salem*.....	50	6	28.8	0.85	8.5	Sanborn.....	45	-16	17.2	.....	4.74	36.0										
Aurora*.....	56	9	29.7	0.30	2.5	Santee Agency.....	47	-1	27.2	0.66	6.8	Stratford.....	39	-27	15.9	.....	3.12	23.0										
Beatrice.....	63	2	26.9	1.70	17.0	Sargent.....	.....	.....	0.59	6.0		Warner.....	.....	.....	.....	5.28	33.0							
Beaver City.....	61	1	30.7	0.18	2.0	Schuyler.....	.....	.....	0.40	4.0		West Milan.....	45	-37	12.5	.....	4.25	37.5								
Benedict.....	.....	.....	.....	0.92	6.0	Seneca*.....	54	0	26.6	0.52	5.0	New Jersey.														
Benkelman.....	.....	.....	.....	0.20	2.0	Seward*.....	48	10	29.7	0.50	5.0	Asbury Park.....	58	6	34.2	.....	3.97	7.0							
Blair.....	43	4	25.6	0.61	6.5	Springview.....	54	-1	26.5	0.15	1.5	Barnegat.....	.....	.....	.....	3.47	8.0									
Bluehill*.....	56	6	30.1	0.30	2.5	Stanton*.....	42	-1	25.4	0.45	4.5	Bayonne.....	59	6	33.0	.....	4.30	12.2										
Brokenbow.....	.....	.....	.....	0.70	7.0	Stockham.....	.....	.....	0.80	6.0		Belvidere.....	53	2	30.2	.....	4.33	12.3					
Burwell.....	.....	.....	.....	1.00	10.0	Strang*.....	52	8	30.8	0.90	9.0	Beverly.....	59	7	33.5	.....	4.75	10.2							
Callaway.....	57	-6	25.5	0.45	5.0	Stratton.....	.....	.....	0.17	.....		Billingsport*.....	52	9	33.3	.....	3.50	10.0							
Camp Clarke.....	.....	.....	.....	1.20	12.0	Superior*.....	50	2	28.2	1.00	10.0	Boonton.....	53	3	29.8	.....	4.89	12.2							
Central City.....	.....	.....	.....	0.50	5.0	Sutton.....	48	7	27.3	0.66	4.2	Bridgeton.....	59	16	37.4	.....	3.98	0.3							
Cody.....	.....	.....	.....	0.60	6.0	Syracuse.....	48	7	31.1	1.75	17.5	Camden.....	58	11	33.4	.....	4.17	10.5							
Columbus.....	4	3	28.7	0.40	3.2	Tecumseh b.....	57	-2	31.0	1.15	11.5	Cape May C. H. t.....	60	14	37.2	.....	3.71	0.8										
Cornelia.....	.....	.....	.....	0.46	.....	Tekamah.....	44	3	26.4	0.75	7.5	Charlotteburg.....	51	2	29.2	.....	4.79	9.0						
Creighton.....	44	-3	24.2	0.21	2.1	Theford*.....	50	-10	24.6	1.20	12.0	Chester.....	50	2	29.1	.....	4.74	12.0										
Crete.....	49	1	29.1	0.29	2.9	Turlington.....	.....	.....	1.82	18.7		Clayton.....	59	12	34.2	.....	2.79	5.2								
Culbertson.....	.....	.....	.....	0.40	4.0	Valentine.....	54	-8	25.4	0.44	4.4	College Farm.....	63	4	33.0	.....	4.13	8.0							

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
New Mexico—Cont'd.						New York—Cont'd.						North Dakota—Cont'd.					
East Las Vegas†	59	-6	31.2	0.51	6.7	Oneonta	55	-10	26.7	3.61		Falconer	45	-15	15.6	0.10	1.0
Eddy	78	12	40.8	0.15	0.5	Oxford	45	-15	23.8	4.76	19.2	Fargo†	40	-16	14.0	0.06	0.6
Engle†	65	-6	35.7	T.	T.	Palermo	42	-32	21.8	2.91	15.2	Forman†	40	-10	15.8	0.00	0.0
Espanola	51	-15	23.3	0.45	4.5	Penn Yan	54	-6	27.3	2.57	9.8	Fort Berthold	69	-14	21.1	0.04	0.5
Folsom	62	-8	29.6			Perry City	47	-6	23.5	2.47	12.4	Fort Yates†	51	-5	20.4	0.20	2.0
Fort Bayard	65	-1	32.6	1.25	8.0	Phoenix				4.50		Gallatin†	40	-22	10.4	0.16	1.6
Fort Union	76	0	36.2	0.39	2.5	Pine City				3.47		Glenullin	45	-11	17.6	T.	T.
Fort Wingate	65	-10	26.3	0.66	6.6	Plattsburg Barracks†	40	-22	15.0			Goetz	39	-15	16.4	T.	T.
Gallisteo†	52	2	28.5	0.75	7.5	Port Jervis	50	-6	26.6	4.21	16.0	Grafton†	37	-24	8.8	0.05	0.5
Gallinas Spring†	62	0	31.8	0.29	5.0	Poughkeepsie	51	-18	25.0	5.27	13.0	Grand Rapids†	45	-10	17.2	0.45	4.5
Gila	63	4	37.3	1.83	5.5	Primrose	57	-4	30.6	3.83	13.5	Hamilton	36	-20	7.8	0.39	4.2
Hillsboro	71	9	37.5	0.67	1.0	Ridgeway	57	42	27.0	3.69	12.4	Jamestown†	41	-11	16.1	0.02	0.2
Laluz	64	16	39.3	0.63	1.5	Rome	44	-13	19.8	5.44		Kelso	38	-15	13.0	0.00	0.0
Las Cruces†	68	7	37.3	0.38		Romulus	53	-4	27.0	4.05	11.0	Larimore†	38	-17	11.2	T.	T.
Lordsburg*	65	6	37.2	0.50	4.0	Rose				5.90		McKinney	35	-32	11.2	0.05	0.5
Los Lunas	58	-10	27.5	1.30	9.5	St. Johnsville	49	-17	22.6	5.19	24.3	Mayville	40	-11	17.4	0.05	0.5
Lower Penasco	70	-10	37.0	0.60	3.5	Saranac Lake	48	-32	14.5	3.39	24.8	Medora†	42	-10	15.6	0.00	0.0
Raton	73	-7	28.6	0.20	2.0	Setauket†	54	6	32.7	4.00	6.0	Melville	39	-13	15.8	T.	T.
Rincon†	72	14	38.9	0.62		Sherwood				2.67		Milton†	32	-20	7.4	0.30	3.0
Roswell†	70	2	36.0	0.26	6.0	Skaneateles				3.69		Minnewaukon	38	-16	12.4	T.	T.
Shattucks Ranch	67	9	39.0	0.35	3.5	South Canisteo	58	-8	26.8	3.90	19.5	Minot	52	-6	17.4	0.06	0.6
Socorro	60	4	32.0	0.78	2.0	Southeast Reservoir				4.60		Minto†	39	-22	10.6	0.10	1.0
White Oaks†	55	-3	30.0	2.21	19.5	South Kortright†	49	-14	22.7	2.84		Napoleon†	41	-14	15.8	0.65	6.5
Winsors Ranch	54	-14	23.3	2.43	25.0	Straits Corners	50	-8	24.4†	3.14	13.6	New England City	42	-12	19.2	0.20	2.0
New York.						Ticonderoga	45	-19	18.6	6.66	32.8	Oakdale†	41	-5	22.0	0.06	0.6
Adams	52	-9	27.7	3.63		Victor	55	-3	25.3	3.15	23.5	Portal	35	-19	12.5	0.00	0.0
Addison	52	-9	27.7	3.91	7.5	Wappingers Falls	52	-15	26.2	5.17	25.5	Power†	41	-14	15.5		
Akron				4.65		Watkins				2.74		St. John†	34	-15	13.2	0.10	1.0
Alden	58	-10	27.2	3.80	7.0	Watertown	49	-26	30.3	5.65		Sheyenne	38	-16	12.8	0.05	0.5
Alfred†	57	-15	23.2			Watkins	55	-1	27.3		11.4	Steele†	45	-14	16.2	0.23	2.3
Angelica†	56	-17	26.4	3.16	15.0	Waverly†	55	-13	27.3	2.65	11.2	Towner†	38	-10	11.8		
Appleton	55	5	27.4	3.23	13.7	Wedgwood	51	-1	25.6	2.73	18.0	University	38	-15	12.4	0.10	1.0
Arcade	56	-14	24.8	4.29	17.5	Westfield	62	13	32.0	2.56	6.0	Valley City†				0.30	2.0
Arkwright	56	-1	27.4			Westpoint†	47	-9	23.2	1.10	4.8	Walsh†	47	-9	19.8	T.	T.
Atlanta				3.35		Willetsport	55	7	32.2	5.13	5.0	White Earth	39	1	19.6	0.10	1.0
Auburn	54	-6	27.2	3.89	13.0	North Carolina.						Wildrice†			13.6	0.22	2.2
Avon	55	-5	27.1	1.98		Asheville†	70	9	40.6	3.60	1.5	Willow City†	36	-8	10.4		
Baldwinsville	54	-8	24.4	4.50	14.0	Beaufort†	71	21	50.2	2.28	T.	Woodbridge†	32	-23	6.8	0.09	0.9
Bedford	57	-6	29.6	4.46	15.9	Biltmore†	73	11	40.9	3.28	1.4	Ohio.					
Big Sandy*	46	-20	30.6			Bryson City†				6.40	4.0	Akron	63	5	32.0	4.51	9.2
Binghamton†	57	-9	26.0	3.93	12.5	Chapelhill†	73	14	42.6	1.85		Annapolis	65	0	31.0	3.26	6.5
Bolivar	58†	-16	25.6†	3.91	12.0	Edenton	72	19	45.9	2.79	T.	Ashland	62	-2	28.8	4.99	5.0
Boonville	42	-16	20.6	5.30	24.0	Experimental Farm	71	24	45.2	1.92	1.5	Ashtabula	62	10	31.1	4.41	12.0
Boys Corners				4.68		Fairbluff†				1.40	0.4	Atwater				4.37	6.5
Brentwood	57	-10	30.7	6.10	16.5	Fayetteville†	78	14	47.4	2.19	0.5	Bangorville	62	-3	30.7	5.08	4.0
Brooklyn	54	7	32.6	5.10	12.0	Flatrock	68	9	38.9	5.35	0.8	Basil				4.79	2.0
Canajoharie	42	-10	23.8	3.14	23.5	Greensboro†	71	13	42.1	1.96		Bellefontaine	61	6	32.2	3.25	1.5
Canton	40	-37	13.8	6.76	29.0	Greenville				1.86	T.	Bement				4.11	5.2
Carmel	50	-10	26.2	4.97	12.5	Henderson†	74	14	42.8	2.14	1.0	Benton Ridge	63	6	31.4	5.46	7.2
Catskill	50	-9	25.6	4.46	13.0	Highlands	63	0	36.8	6.09	2.8	Bethany	65	8	36.0	5.84	
Cedar Hill	50	-13	23.8	3.35	17.5	Lenoir†	69	16	39.9	3.21	1.5	Big Prairie	64	0	31.6	5.04	2.0
Charlotte*	52	3	28.8			Linville†	61	4	35.6	4.38	5.5	Binola				3.64	10.0
Cherry Creek				6.19		Littleton†	73	13	41.8	1.94	0.2	Bissell	60	1	30.5	4.10	14.9
Cooperstown†	50	-15	21.8	4.90	23.5	Louisburg	73	17	44.5	2.29		Bladensburg	64	-12	30.9	5.11	3.0
Cortland	52	-9	25.4	4.74	33.0	Lumberton†	76	20	48.4	1.92	T.	Bloomington	64	-3	34.1	6.05	5.0
Dekalb Junction				4.76		Lynn†	74	19	46.0	3.67	1.0	Bowling Green	65	4	30.0	3.75	2.0
Dryden	54	-7	25.0			Mana				2.18	1.0	Bucyrus	60	-4	31.1	3.80	
Eagle Mills				2.84		Marion	75	12	42.6	4.52	1.5	Cambridge	65	-3	32.0	5.59	4.0
Easton	42	-26	15.6	4.40	15.0	Mocksville	73	27	47.6	2.52	2.0	Camp Dennison	66	4	35.4	7.95	1.1
Elizabethtown	42	-26	15.6	4.40	15.0	Moncure†	75	17	46.0	1.75	T.	Canal Dover	64	-5	32.0	4.65	3.0
Elmira	56	0	28.6	2.45	11.5	Monroe†	72	15	44.0	2.34	1.0	Canton†	71	3	32.9	4.64	6.9
Fayetteville				2.76		Morgantown	74	12	39.7	3.25	1.0	Cardington	63	-10	28.8	3.84	1.0
Fleming	5																

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.						Oklahoma—Cont'd.						Pennsylvania—Cont'd.					
Hiram	61	4	28.6	4.41	10.5	Winnview	70	12	38.2	2.01	2.0	Everett	52	4	32.4	3.35	7.8
Hudson	61	4	29.6	5.49	9.5	Oregon.						Farrandsville	54	13	34.6	3.56	5.0
Jacksonboro	65	4	33.8	6.70	2.0	Albany	54	27	41.0	4.07	3.0	Forks of Neshaminy	54	13	34.6	3.88	...
Kenton	64	4	31.8	4.54	1.3	Arlington	49	18	34.0	0.87	0.8	Franklin	65	4	31.0	4.51	10.0
Killbuck	63	1	31.6	2.63	2.5	Ashland	64	13	35.3	1.38	4.0	Frederick	...	...	...	3.76	...
Lancaster	67	10	33.6	5.80	2.5	Aurora	50	25	38.5	3.97	1.0	Freeport	...	...	...	5.68	23.0
Leipsic	62	3	29.6	4.34	5.0	Aurora (near)	52	23	38.4	3.81	1.5	Girardville	...	...	...	5.43	21.5
Levering	62	18	28.8	5.29	3.0	Bandon	60	28	44.3	5.78	...	Grampan	54	0	27.6	3.81	13.0
Logan	68	12	35.2	7.20	3.5	Bay City	55	24	40.3	14.26	3.1	Greensboro	67	...	...	4.95	6.2
Lordstown	63	0	29.6	4.15	5.2	Beulah	43	19	16.6	0.48	6.0	Greenville	61	3	32.6	6.84	11.4
McArthur	67	17	33.7	7.81	8.0	Brownsville	55	28	42.0	2.47	1.0	Hallstead	50	2	26.1	...	...
McConnelsville	70	3	34.4	6.87	4.0	Burns	66	21	17.5	1.45	14.5	Hamburg	53	8	33.5	6.06	6.5
Mansfield	...	...	...	5.47	5.0	Burns (near)	55	8	27.0	0.79	5.1	Hawley	56	4	27.3	4.25	14.4
Marletta	66	6	38.0	5.74	1.5	Cascade Locks	48	26	37.8	10.63	3.0	Holidaysburg	61	7	31.8	4.64	8.5
Marion	63	7	31.1	4.04	1.0	Comstock	55	28	41.5	3.36	4.0	Huntingdon	54	6	31.6	4.68	11.0
Medina	64	3	30.8	4.37	6.0	Corvallis	56	23	39.4	3.82	3.5	Huntingdon	66	1	33.4	4.60	8.0
Millfordton	60	10	28.6	5.21	5.5	Dayville	57	5	30.0	1.25	6.2	Indiana	66	1	33.4	2.68	7.0
Milligan	68	15	33.6	5.78	11.0	Eugene	52	26	38.8	2.43	1.3	Irwin	...	...	...	3.96	3.0
Millport	63	1	30.6	4.47	4.8	Fairview	56	26	41.7	7.87	5.2	Johnstown	66	8	33.0	7.57	13.2
Montpelier	61	6	28.4	3.72	14.5	Falls City	50	22	37.6	6.53	4.4	Karthauss	...	...	...	2.00	12.0
Napoleon	62	5	29.7	3.84	3.0	Fife	49	9	24.6	0.90	9.0	Keating	...	...	...	3.36	6.7
Neapolis	...	...	...	3.16	...	Forest Grove	56	14	36.4	3.85	4.0	Kennett Square	59	11	34.2	4.31	10.5
New Alexandria	65	3	32.2	5.28	3.0	Fort Klamath	38	10	19.0	2.01	17.2	Lansdale	...	...	...	3.86	...
New Berlin	60	3	30.1	3.82	5.0	Gardiner	57	28	43.8	7.03	...	Lawrenceville	51	16	27.6	2.10	5.2
New Bremen	52	8	33.3	3.28	1.0	Glenora	49	18	36.8	11.71	6.5	Lebanon	53	8	32.0	4.27	13.2
New Holland	65	7	32.9	6.36	2.5	Government Camp	51	2	28.2	11.46	81.0	Leroy	43	3	26.1	3.30	12.5
New Moscow	...	...	...	4.79	2.2	Grants Pass	52	19	36.3	1.78	3.0	Lewisburg	48	1	29.8	3.62	7.0
New Paris	53	2	31.5	5.72	0.7	Happy Valley	50	13	30.3	1.17	12.0	Lock Haven	50	1	31.4	3.99	7.0
New Waterford	62	4	33.0	6.43	11.0	Heppner	47	7	31.8	1.26	2.2	Lock Haven	...	...	...	4.11	18.0
North Lewisburg	63	2	30.0	5.71	3.2	Hood River (near)	46	21	35.2	3.72	7.5	Lock No. 4	66	7	33.2	5.02	8.7
North Royalton	62	0	30.1	4.33	10.0	Irvington	...	...	...	3.60	...	Lycippus	...	...	...	5.33	11.4
Norwalk	65	1	31.8	4.14	2.8	Jacksonville	47	15	33.4	1.54	5.2	Mifflin	...	...	...	3.01	4.0
Oberlin	64	7	31.6	3.60	4.0	Joseph	36	8	18.2	1.80	18.0	Oil City	...	...	...	5.32	12.5
Ohio State University	66	11	32.8	5.34	1.0	Junction City	70	28	42.7	2.54	1.0	Ottsville	...	...	...	4.32	...
Orangeville	62	6	30.2	4.06	6.0	Klamath Falls	46	0	26.8	0.66	6.6	Parker	...	...	...	5.50	12.0
Ottawa	65	9	33.2	4.23	5.0	Lafayette	54	24	39.5	1.92	2.5	Philadelphia	59	12	35.6	4.45	8.0
Pataskala	64	13	31.9	6.28	2.0	Lagrange	54	6	26.8	2.22	35.2	Point Pleasant	...	...	...	4.15	...
Perry	...	...	...	2.76	4.8	Lakeview	50	10	23.4	1.40	14.0	Pottstown	53	11	33.4	5.95	12.5
Philo	64	1	32.8	6.84	3.0	Langlois	64	28	46.1	7.09	...	Quakertown	55	4	30.6	4.20	13.5
Plattsburg	63	2	32.1	5.30	3.0	Lorella	50	7	18.9	0.42	5.0	Reading	...	...	...	3.24	4.03
Pomeroy	68	3	36.4	...	3.5	McMinnville	51	12	37.8	4.17	2.2	Reedsville	48	1	30.8	1.32	14.0
Portsmouth	70	4	38.9	9.23	1.0	Merlin	44	18	31.6	2.03	5.0	Renovo	...	...	...	3.22	6.5
Portsmouth	62	1	30.8	4.57	1.8	Monmouth	54	27	41.6	1.95	2.0	Renovo	48	0	30.4	3.80	7.2
Richwood	63	4	29.2	3.48	3.5	Monroe	53	23	39.0	2.94	3.0	Ridgway	...	...	...	5.04	19.5
Ridgeville Corners	65	8	37.0	9.44	1.6	Moro	44	11	31.4	0.50	4.0	Saegerstown	61	10	28.0	4.87	14.1
Ripley	63	8	30.0	4.16	4.0	Mount Angel	53	26	39.2	4.86	0.2	Salem Corners	48	0	25.6	4.14	21.6
Rittman	63	5	30.4	4.14	3.0	Nehalem	...	...	...	11.52	4.5	Seranton	48	2	28.6	3.59	12.5
Rockyridge	63	5	30.1	4.14	3.0	Newberg	53	14	38.5	3.98	2.0	Seisholtzville	...	...	...	4.33	...
Rosewood	63	1	30.4	4.49	2.0	Newbridge	55	10	21.8	0.62	8.0	Selinsgrove	50	2	31.5	4.08	8.0
Shenandoah	62	3	29.9	3.66	1.9	Newport	56	28	43.4	7.80	1.0	Shawmont	...	...	...	3.97	14.8
Sidney	63	5	31.5	4.39	1.7	Pendleton	56	10	34.0	1.43	3.0	Shinglehouse	60	12	26.6	3.27	17.0
Sinking Spring	66	1	35.8	7.07	6.5	Riddicks	55	26	38.5	2.29	3.0	Sinamahoning	...	...	...	2.14	...
Somerset	63	0	33.8	5.38	3.7	Riverside	42	19	19.8	0.66	6.8	Smethport	57	9	26.9	3.42	9.5
Springboro	...	...	...	5.10	1.0	Salem	52	25	39.6	...	...	Smiths Corners	61	2	30.9	4.07	18.4
Spring Valley	63	5	32.6	6.02	1.5	Sheridan	55	17	40.8	3.82	5.0	Somerset	49	6	31.8	...	...
Strongsville	...	...	...	4.55	11.2	Silver Lake	48	9	23.4	0.27	2.8	South Bethlehem	54	3	28.4	3.93	13.0
Sylvania	62	3	27.4	4.61	12.0	Silverton	54	28	40.5	2.58	0.2	South Eaton	55	0	29.2	4.40	18.4
Thurman	70	5	37.2	7.58	1.0	Siskiyou	48	18	32.7	2.90	29.0	State College	...	...	...	1.73	14.0
Tiffin	64	8	32.0	4.75	3.2	Sparta	40	3	19.7	4.20	42.0	Sunbury	55	13	33.1	4.08	4.5
Upper Sandusky	64	7	32.8	4.14	3.0	Springfield	50	27	38.7	3.07	2.0	Swarthmore	60	1	26.4	4.35	...
Urbana	61	1	31.6	3.97	2.5	Stafford	48	21	37.6	3.89	1.0	Swiftwater	54	10	28.0	2.52	5.5
Vanceburg	70	4	36.7	8.40	1.0	The Dalles	52	21	36.2	0.82	1.8	Towanda	61	10	34.9	5.62	7.0
Van Wert	65	6	30.2	4.15	2.5	Umatilla	...	...	...	0.31	4.0	Uniontown	57	3	28.3	2.75	14.0
Vermilion	64	6	30.9	4.37	11.0	Vale	38	17	17.6	1.11	11.0	Warren	46	7	28.0	1.72	6.5
Vicksburg	64	6	31.4	2.57	1.3	Vernonia	49	14	35.9	4.32	6.5	Wellsboro	58	9	32.8	4.21	12.2
Walnut	...	...	...	5.27	3.3	West Fork	48	26	38.2	4.87	7.0	West Chester	...	...	...	5.60	12.0
Wars																	

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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Greenville	75	15	44.2	3.54	T.			Elk Valley	69	16	43.0	7.67	4.0	Mann	87	29	54.6	1.25																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									</

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.	
Maximum.		Minimum.		Mean.		Rain and melted snow.	Total depth of snow.	Maximum.		Minimum.		Mean.		Rain and melted snow.	Total depth of snow.	Maximum.		Minimum.		Mean.		Rain and melted snow.	Total depth of snow.
Stations.								Stations.								Stations.							
Virginia—Cont'd.																							
Hot Springs	63	5	36.5	1.99	2.0			West Virginia—Cont'd.	70	—5	37.8	4.45					Arizona.	63	14	35.5	3.42		
Leesburg	62	10	38.0	2.58	2.5			Powellton	63	14	35.5	3.42					Walnut Grove	62	11	36.8	2.58		
Lexington†	62	11	36.8	2.79	4.2			Romney	75	9	38.2	3.26	7.6				California.	65	4	37.8	4.26		
Manassas†	65	4	37.8	4.24	2.0			Rowlesburg†	67	10	37.0	7.55	9.0				Point George, L. H.	58	2	33.2	4.24		
Marion†	58	2	33.2	4.26	5.0			Upper Tract	69	9	36.2	5.00	2.5				Indiana.	73	12	41.9	1.43		
Monterey	73	12	41.9	1.43	3.0			Weston a									Topeka	73	15	42.0	1.21		
Nottoway	73	15	42.0	1.21	2.1			Weston b†									Kansas.						
Petersburg†				1.20	2.0			Wheeling a†									Mounthope					1.71	5.0
Radford				1.20	2.0			Wheeling b†									Olathe					1.03	9.0
Richmond (near)†	68	15	40.7	1.72	3.5			Wisconsin.									Wamego					1.01	10.1
Rockymount†	67	12	42.6	2.70	2.5			Amherst	46	—4	20.3	1.00	9.5				Kentucky.					2.83	T.
Salem†	67	13	41.7	2.95	3.0			Bayfield	40	—1	22.1	0.80	8.0				Frankfort						
Speers Ferry				6.69	3.0			Beloit	39	2	23.8	2.51	16.7				Maryland.						
Spottsville†	76	16	42.2	1.64	1.0			Brodhead	44	—11	21.5	1.96	17.5				Hagerstown	66	13	37.8			
Stanardsville†	69	11	36.8	2.49	4.0			Butternut	50	—12	18.9	0.77	7.8				Michigan.						
Staunton†	64	11	38.6	2.89	2.0			Chilton	46	2	23.4	0.63	3.5				Benzonia	54	9	27.7	4.10	18.0	
Stephens City†	65	13	36.0	4.12	1.5			Citypoint	40	0	21.2	0.55	5.5				Missouri.						
Sunbeam†	73	16	43.8	1.71	T.			Delavan	40	—7	21.4	1.59	13.0				Humansville	65	10	32.6	2.59	9.5	
Warrenton	57	19	38.2					Dodgeville†	40	—11	21.4	1.64	12.5				Nevada					2.28	9.2
Warsaw†	66	16	38.4	1.47	2.0			Easton	42	—6	19.6	0.75	4.0				Trenton	50	—3	23.8	1.20	12.0	
Westbrook Farm	65	16	40.6					Eau Claire	36	—5	20.6	0.32	4.0				Montana.						
Woodstock†	64	4	35.8	3.30	1.0			Florence†	40	—7	17.6	0.30	3.0				Fort Logan	53	—24	20.4	0.21		
Wytheville†	65	8	37.1	3.30	3.0			Fond du Lac	38	1	21.8	1.08	5.8				Kalispell	56	—15	22.5	0.6	2.0	
Washington.								Grand River Locks				1.45	5.0				Poplar	52	—34	15.8	0.30	0.0	
Aberdeen	57	28	38.8	5.85	5.0			Grantsburg†	41	—13	19.1	0.39	4.0				Radersburg	50	—21	22.8	T.	T.	
Anacortes				1.92				Grafton	44	—4	22.8	2.00	20.0				Troy					3.44	8.0
Ashford†				5.14	14.8			Hartford				2.68	17.0				Utica	50	—22	22.8	0.80	8.0	
Blaine†	48	8	32.6	4.36	2.0			Hartland	40	—7	22.6	2.45	26.3				Yale	53	—19	23.5	0.07	0.5	
Bridgeport	37	—3	18.0	T.	T.			Harvey	39	2	22.6	1.94	16.6				Nebraska.						
Cascade Tunnel	40	5	25.2	7.34	69.0			Hayward	42	—12	19.4	0.47	4.8				Benkelman					0.45	4.5
Centerville†	53	5	31.8	0.71	2.1			Hillsboro	44	1	21.4	0.95	6.0				Haigler					0.20	2.0
Chehalis†	48	25	36.4	1.92	5.0			Kenosha	42	6	21.5						New Hampshire.						
Clearwater	61	28	39.4	15.62	1.8			Koepnick†	40	0	17.1	0.80	8.0				Warner					7.02	17.5
Colfax	42	0	27.3	2.51	17.0			Lancaster†	44	1	22.2	1.30	6.0				Nevada.						
Coupeville†	52	24	38.8	0.97	6.8			Lincoln†	37	3	21.6	0.65	6.5				Keyser Springs					0.27	3.0
Dayton	49	12	31.1	3.40	3.0			Madison†	37	1	22.0	3.59	33.6				New York.						
Ellensburg	40	—5	30.4	0.36				Manitowoc†	42	2	24.6	1.18	8.2				Potsdam	58	—13	21.8	3.26		
Ellensburg (near)	34	0	30.0	0.45	4.5			Meadow Valley†	42	—8	19.0	0.40	4.0				Victor	60	2	29.0			
Fort Simcoe†	53	8	37.6	0.40	4.0			Medford†	44	—9	17.6	0.02	0.2				Oklahoma.						
Fort Spokane	34	—9	21.2	1.85	18.5			Menasha				1.03	7.6				Fort Reno					0.50	T.
Grandmound†	49	20	37.6	3.43	1.4			Neillsville†	36	—4	18.2	0.85					Waukomis					0.48	
Hunters†	42	—5	19.3	0.94	11.0			New Holstein	35	0	16.6	2.45	21.0				Oregon.						
Kennewick†	48	12	31.4	0.73	3.2			New London	40	1	20.2	0.81	7.0				Forest Grove					14.63	0.2
La Center	49	19	37.4	5.25	4.5			North Crandon	55	—22	18.2	0.50	5.0				Moro					2.06	2.0
Lakeside	40	7	22.0	0.30	3.0			Oconto	42	—1	22.2	1.10	11.0				Pennsylvania.						
Lapush	46	25	37.5	9.85	3.0			Oscoda†	42	—12	20.1	0.03	0.3				Lock Haven a					2.98	7.5
Lind	41	4	25.8	0.85	7.6			Pepin	42	—14	17.7	0.21	2.0				Lock Haven b					2.59	3.5
Loomis†	34	5	22.6	0.45	4.5			Pine River†	42	1	21.2	0.80	4.3				Rhode Island.						
Madrone†	48	24	38.8	2.21	2.0			Portage†	38	—5	19.6	1.55	7.0				Kingston	56	8	32.4	6.25	4.5	
Mayfield†	57	30	39.6	5.64	2.0			Port Washington	47	—8	24.4	4.00	45.0				Utah.						
Moxee Valley†	48	—2	27.1	0.75	7.5			Prairie du Chien	53	1	25.3	0.89	2.5				Giles					0.23	1.0
New Whatcom	50	18	38.2	1.69	0.5			Racine	47	6	26.6	3.51	34.5				Washington.						
Northbend	52	21	38.2	6.80	2.0			Sharon	43	—13	21.6	2.48	30.5				Colfax	49	8	31.4	3.92	3.0	
Olga	47	25	38.3	1.33	T.			Shawano				0.48	5.0				Wisconsin.						
Olympia†	50	24	39.2	3.96	1.0			Spooner	39	—12	19.6	0.70	7.0				Menasha					1.06	14.5
Orcas Island	47	24	38.9	1.41	1.0			Stevens Point†	43	—1	19.8	0.55	3.5										
Pinehill†	48	18	34.3	1.89	5.5			Sturgeon Bay Canal	40	1	23.2												
Pomeroy	55	28	40.6	1.09	0.8			Valley Junction†	43	—6	20.4	0.69	4.8										
Port Townsend	41	1	24.8	3.30	33.0			Viroqua	41	0	22.4	1.15	3.2</										

TABLE III.—Data furnished by the Canadian Meteorological Service, January, 1898.

Stations.	Pressure.			Temperature.				Precipitation.			Stations.	Pressure.			Temperature.				Precipitation.		
	Mean not reduced.	Mean reduced.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Total.	Departure from normal.	Depth of snow.		Mean not reduced.	Mean reduced.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Total.	Departure from normal.	Depth of snow.
St. John's, N. F.	29.55	29.70	-.14	18.5	-.5.3	23.5	11.5	9.72	.....	57.7	Saugeen, Ont.	29.23	29.99	-.07	23.4	+3.0	30.3	16.4	2.77	-.0.69	21.3
Sydney, C. B. I.	29.83	29.89	-.01	17.9	-.4.6	26.7	9.1	5.95	+1.14	41.5	Parry Sound, Ont.	29.24	29.98	-.10	16.2	+2.4	26.9	5.5	3.38	+0.23	29.2
Halifax, N. S.	29.82	29.96	-.00	20.7	-.1.1	30.0	11.4	4.75	-0.94	17.6	Port Arthur, Ont.	29.23	29.98	-.12	10.4	+7.3	21.8	1.0	0.51	-0.30	5.1
Grand Manan, N. B.	29.88	29.93	-.06	22.2	-.1.2	30.9	13.4	4.92	-0.45	15.3	Winnipeg, Man.	29.10	30.00	-.18	3.7	+10.5	15.4	7.9	0.81	+0.15	8.9
Yarmouth, N. S.	29.86	29.94	-.08	23.6	-.2.7	31.7	15.4	4.75	-0.47	27.3	Minnedosa, Man.	29.06	30.02	-.14	4.5	+11.7	15.8	6.9	0.39	-0.24	3.9
Charlottetown, P. E. I.	29.88	29.92	-.04	14.1	-.2.9	22.2	6.0	4.22	+0.81	27.4	Qu'Appelle, Assin.	27.56	29.98	-.18	8.5	+12.3	18.4	1.5	0.56	+0.18	5.6
Chatham, N. B.	29.92	29.94	-.08	4.6	-.5.2	16.4	7.1	2.97	-1.31	27.7	Medicine Hat, Assin.	27.55	29.97	-.21	19.6	+14.1	31.1	5.1	0.45	-0.12	4.5
Father Point, Que.	29.96	29.99	-.03	4.3	-.3.7	14.4	5.7	1.98	-0.72	19.8	Swift Current, Assin.	27.27	29.99	-.19	17.2	+14.1	25.1	9.2	0.57	-0.04	5.7
Quebec, Que.	29.63	29.99	-.07	8.6	-.0.5	16.5	0.6	3.15	-0.52	31.5	Calgary, Alberta	26.24	29.94	-.34	20.9	+12.5	31.2	10.7	0.20	-0.37	2.0
Montreal, Que.	29.77	30.00	-.08	12.1	-.0.4	20.0	4.2	6.18	-2.90	62.7	Banff, Alberta	25.22	30.07	-.07	16.4	.....	24.5	8.4	0.22	.....	2.2
Rockliffe, Ont.	29.46	30.02	-.04	7.0	-.0.5	19.2	5.2	1.81	-0.20	18.0	Edmonton, Alberta	27.47	29.93	-.30	18.0	+16.2	27.0	9.2	0.24	-0.49	2.4
Ottawa, Ont.	29.66	30.05	.....	10.6	+1.0	20.4	0.8	4.30	.....	36.4	Prince Albert, Sask.	28.24	29.88	.....	3.4	+11.8	14.3	7.5	0.74	.....	7.4
Kingston, Ont.	29.66	30.00	-.08	18.6	+1.5	27.6	9.6	4.26	+1.00	18.0	Battleford, Sask.	28.05	29.93	.....	5.0	+10.9	15.1	5.1	0.53	.....	5.3
Toronto, Ont.	29.59	30.03	-.06	25.5	+4.1	32.6	18.4	3.63	+1.12	12.5	Kamloops, B. C.	28.74	30.10	.....	22.8	.....	29.4	16.1	1.00	.....	10.0
White River, Ont.	28.57	30.04	-.06	2.9	-.3.3	19.4	-13.6	1.58	-0.25	15.8	Esquimalt, B. C.	30.04	30.08	.....	39.0	+0.9	42.8	35.1	2.68	.....	1.0
Port Stanley, Ont.	29.32	30.01	-.09	26.0	+3.8	33.0	19.4	4.36	+1.68	20.3	Hamilton, Bermuda	29.93	30.09	-.04	62.7	+0.7	67.8	57.6	3.26	.....	1.0

TABLE IV.—Mean temperature for each hour of seventy-fifth meridian time, January, 1898.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Bismarck, N. Dak.	15.1	14.4	13.7	13.1	12.7	12.5	11.9	11.3	10.6	10.8	12.9	16.4	19.9	22.9	25.3	26.5	27.3	25.9	23.0	20.6	18.4	17.2	16.0	15.1	17.2
Boston, Mass.	27.5	27.2	26.7	26.3	26.0	25.7	25.7	25.5	25.9	26.8	28.6	30.5	31.7	32.5	32.8	32.7	32.3	31.7	30.8	29.8	29.3	28.8	28.0	27.7	28.8
Buffalo, N. Y.	27.1	27.0	26.8	26.9	27.0	26.9	26.9	27.0	27.6	28.4	29.2	30.1	30.4	30.8	30.8	30.6	30.1	29.6	29.0	28.8	28.3	27.8	27.3	27.0	28.4
Chicago, Ill.	28.4	27.7	27.1	26.5	26.1	25.7	25.7	25.8	26.2	27.4	28.9	30.1	30.8	31.5	31.7	31.4	30.8	30.5	29.7	29.3	28.9	28.4	27.9	27.4	28.6
Cincinnati, Ohio	35.6	35.2	34.9	34.7	34.3	34.3	34.5	35.0	34.4	34.6	35.6	36.5	37.3	38.1	38.9	39.5	39.6	39.1	38.4	37.8	37.0	36.6	36.0	35.8	36.4
Cleveland, Ohio	30.5	30.0	29.8	29.6	29.5	29.4	29.2	29.3	29.1	30.1	31.2	31.9	32.3	32.7	32.8	33.0	32.9	32.6	32.3	31.8	31.5	31.0	30.5	30.3	31.0
Detroit, Mich.	27.3	27.2	27.0	26.7	26.4	26.0	25.9	26.3	26.2	27.1	28.4	29.3	29.9	30.7	31.1	30.9	30.5	29.9	29.0	28.0	27.8	27.6	27.3	27.0	28.1
Dodge City, Kans.	25.4	24.8	23.8	23.3	22.2	21.8	21.3	20.9	20.7	20.7	23.6	28.1	32.6	35.1	37.2	38.9	39.5	39.0	36.5	34.4	31.1	29.6	27.8	26.9	28.5
Eastport, Me.	17.7	17.5	17.5	17.3	16.9	16.7	16.5	16.8	17.7	18.7	19.6	20.6	21.2	21.9	21.9	21.7	20.9	20.6	20.2	20.0	19.2	18.5	18.1	17.8	19.0
Galveston, Tex.	57.1	56.8	56.9	56.9	56.7	56.5	56.1	55.5	55.0	55.3	56.2	57.0	58.1	58.3	59.2	59.3	59.3	59.0	58.2	58.1	57.9	57.9	57.7	57.5	57.4
Havre, Mont.	20.2	19.4	18.9	18.5	18.4	17.8	17.4	17.1	16.6	17.8	19.5	21.8	23.9	26.7	28.0	28.9	28.7	27.3	24.8	23.9	23.1	22.0	21.0	21.0	21.6
Kansas City, Mo.	31.4	30.8	30.1	29.6	29.3	28.7	28.4	28.6	28.3	29.0	30.4	32.2	33.8	35.3	35.9	36.9	37.0	36.4	35.2	34.0	33.1	32.8	32.2	31.8	32.1
Key West, Fla.	67.9	67.9	68.0	67.9	67.7	67.8	67.6	67.6	68.6	69.3	70.9	71.4	71.8	72.0	72.2	72.5	71.7	71.3	70.3	69.6	69.5	69.3	68.8	68.4	69.6
Memphis, Tenn.	45.4	44.8	44.3	44.0	43.6	43.3	43.1	42.9	43.0	43.7	45.0	47.0	48.4	49.8	50.6	51.4	51.5	51.0	49.8	49.2	48.1	47.3	46.7	46.0	46.7
New Orleans, La.	54.4	56.2	55.9	55.4	54.9	54.6	54.2	53.9	54.8	56.7	58.9	60.4	61.6	62.0	63.1	63.2	63.0	61.7	60.5	59.4	58.4	57.9	57.4	57.4	58.3
New York, N. Y.	30.3	29.9	29.6	29.6	29.6	29.9	29.9	30.4	31.1	31.7	32.9	33.8	34.3	34.7	35.2	35.0	33.9	33.1	32.5	31.5	31.4	31.2	30.9	30.7	31.8
Philadelphia, Pa.	33.3	33.0	32.7	32.6	32.7	32.8	33.1	33.2	33.6	34.9	36.3	37.4	38.5	39.1	39.2	39.1	38.3	37.4	36.4	35.9	35.2	34.8	34.1	33.8	35.3
Pittsburg, Pa.	33.4	33.0	32.9	32.9	32.5	32.6	32.5	33.0	33.3	34.0	35.1	36.1	37.0	37.2	37.9	38.4	40.3	41.1	41.6	41.7	40.9	40.7	40.1	39.4	38.8
Portland, Oreg.	38.3	38.0	37.9	37.7	37.4	36.9	36.7	37.0	36.6	36.5	36.6	37.2	37.7	38.4	39.7	40.8	41.6	41.5	40.9	40.1	39.7	38.8	38.2	37.4	36.6
St. Louis, Mo.	35.8	35.5	35.1	34.5	33.9	33.5	33.3	33.3	33.3	33.3	34.3	35.7	37.1	38.2	39.7	40.8	41.6	41.5	40.9	40.1	39.7	38.8	38.2	37.4	36.6
St. Paul, Minn.	30.5	19.7	19.2	18.9	18.5	18.6	18.3	18.1	17.7	17.3	19.0	21.4	23.9	25.9	27.7	28.6	28.8	28.2	26.7	25.4	24.3	23.3	22.2	21.3	22.2
Salt Lake City, Utah	18.3	17.9	17.2	16.7	16.8	16.7	16.2	16.6	15.6	15.3	16.7	19.5	21.9	23.9	25.4	26.5	26.6	27.0	25.5	24.8	24.0	23.6	23.2	21.3	22.2
San Diego, Cal.	49.3	48.8	48.0	47.5	46.9	46.3	46.0	45.2	45.0	45.2	46.4	50.8	53.9	55.6	56.0	56.6	56.5	55.5	54.3	53.0	51.7	50.9	50.0	49.4	50.6
San Francisco, Cal.	46.9	46.4	45.6	45.1	44.3	43.9	43.4	43.5	42.9	42.7	42.9	43.5	44.6	45.6	47.5	49.1	50.3	50.8	50.9	50.2	49.3	48.6	48.0	47.4	46.4
Savannah, Ga.	51.9	51.1	50.7	50.3	49.9	49.5	49.1	48.5	47.9	47.5	49.1	53.9	57.1	59.9	61.6	63.0	62.8	61.4	58.6	56.9	55.7	54.6	53.5	53.2	52.7
Washington, D. C.	33.9	33.7	33.6	33.8	33.7	33.7	33.5	33.6	34.8	36.2	37.8	39.1	40.1	40.9	41.3	41.5	40.6	39.4	37.9	37.3	36.4	35.9	35.2	34.2	36.6

TABLE V.—Mean pressure for each hour of seventy-fifth meridian time, January, 1898.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Bismarck, N. Dak....	28.302	.197	.197	.203	.205	.203	.201	.197	.195	.198	.203	.205	.201	.183	.170	.165	.164	.176	.187	.193	.195	.196	.198	.200	.193
Boston, Mass.....	29.830	.823	.819	.812	.807	.818	.830	.839	.847	.852	.839	.822	.807	.808	.812	.819	.830	.839	.844	.843	.839	.831	.821	.828	.828
Buffalo, N. Y.....	29.112	.115	.136	.134	.132	.128	.134	.141	.144	.147	.143	.124	.106	.096	.100	.102	.109	.114	.117	.122	.116	.115	.116	.113	.120
Chicago, Ill.....	29.064	.100	.114	.110	.105	.103	.111	.125	.130	.139	.137	.127	.105	.091	.087	.090	.092	.096	.102	.106	.101	.103	.103	.108	.107
Cincinnati, Ohio....	29.356	.360	.369	.370	.370	.373	.381	.387	.402	.413	.414	.399	.370	.355	.345	.347	.349	.354	.360	.365	.365	.366	.366	.364	.371
Cleveland, Ohio.....	29.146	.147	.156	.158	.155	.154	.152	.160	.164	.173	.179	.165	.145	.133	.135	.139	.143	.147	.151	.158	.161	.160	.155	.152	.154
Detroit, Mich.....	29.179	.178	.186	.188	.183	.183	.180	.182	.193	.200	.210	.198	.179	.160	.161	.164	.168	.178	.185	.195	.195	.188	.187	.184	.184
Dodge City, Kans....	27.400	.396	.396	.403	.404	.403	.405	.410	.415	.421	.431	.432	.415	.391	.372	.364	.364	.366	.373	.380	.388	.391	.396	.396	.396
Gastport, Me.....	29.816	.820	.815	.812	.807	.811	.827	.845	.856	.857	.838	.823	.807	.804	.807	.815	.827	.835	.844	.846	.843	.839	.829	.824	.827
Galveston, Tex.....	30.090	.055	.057	.054	.051	.054	.062	.069	.083	.097	.103	.092	.068	.045	.033	.027	.025	.029	.033	.041	.048	.055	.059	.059	.057
Havre, Mont.....	27.263	.263	.260	.264	.267	.262	.255	.252	.251	.255	.265	.275	.271	.256	.244	.235	.228	.240	.242	.245	.250	.252	.256	.257	.255
Kansas City, Mo....	29.037	.035	.042	.043	.036	.031	.033	.036	.044	.058	.069	.064	.044	.025	.014	.017	.020	.023	.029	.035	.040	.044	.047	.045	.038
Key West, Fla.....	30.147	.139	.134	.131	.133	.136	.148	.165	.181	.191	.184	.163	.138	.120	.111	.114	.117	.124	.134	.146	.154	.158	.155	.150	.145
Memphis, Tenn.....	29.673	.673	.671	.675	.674	.677	.677	.685	.696	.704	.712	.703	.679	.656	.639	.639	.641	.645	.653	.657	.663	.668	.673	.672	.671
New Orleans, La....	30.091	.093	.093	.093	.093	.093	.104	.115	.128	.139	.141	.122	.093	.073	.061	.056	.057	.061	.069	.077	.087	.091	.092	.091	.092
New York, N. Y.....	29.644	.643	.643	.643	.640	.634	.639	.651	.665	.681	.687	.678	.657	.642	.635	.639	.647	.655	.660	.666	.668	.666	.658	.651	.655
Philadelphia, Pa....	29.884	.889	.899	.893	.891	.893	.908	.922	.935	.943	.935	.913	.891	.884	.888	.892	.900	.906	.911	.913	.913	.910	.904	.900	.906
Pittsburg, Pa.....	29.097	.100	.103	.103	.104	.108	.110	.115	.126	.133	.127	.118	.097	.083	.084	.090	.095	.101	.105	.109	.111	.113	.112	.102	.106
Portland, Oreg.....	29.990	.992	.993	.992	.995	.998	.994	.991	.988	.990	.996	.004	.014	.018	.006	.994	.977	.975	.974	.976	.976	.978	.977	.980	.990
St. Louis, Mo.....	29.447	.449	.451	.455	.454	.456	.459	.460	.467	.475	.482	.474	.451	.432	.423	.419	.430	.432	.435	.439	.448	.449	.452	.450	.450
St. Paul, Minn.....	29.093	.092	.094	.100	.100	.092	.092	.088	.090	.098	.105	.100	.092	.070	.058	.058	.062	.067	.074	.080	.085	.088	.087	.091	.086
Salt Lake City, Utah	25.725	.727	.721	.725	.734	.719	.713	.713	.719	.725	.735	.745	.743	.728	.712	.690	.697	.700	.704	.711	.717	.717	.714	.716	.719
San Diego, Cal.....	30.010	.011	.008	.008	.010	.006	.000	.996	.000	.005	.019	.039	.046	.040	.015	.996	.983	.979	.982	.984	.988	.986	.004	.009	.006
San Francisco, Cal..	30.022	.022	.025	.027	.033	.031	.024	.023	.024	.029	.037	.050	.056	.050	.017	.999	.989	.983	.983	.983	.987	.993	.000	.009	.016
Savannah, Ga.....	30.058	.058	.058	.058	.061	.065	.075	.080	.097	.109	.102	.082	.051	.032	.027	.029	.037	.043	.033	.030	.035	.068	.070	.064	.063
Washington, D. C....	29.917	.925	.927	.925	.927	.937	.948	.961	.980	.988	.979	.955	.936	.925	.924	.924	.930	.937	.940	.940	.938	.938	.932	.925	.940

JANUARY, 1898.

MONTHLY WEATHER REVIEW.

37

TABLE VI.—Average wind movement for each hour of seventy-fifth meridian time, January, 1898.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Abilene, Tex.	10.3	10.3	9.1	8.1	8.3	8.3	8.7	8.4	8.7	8.9	10.1	11.3	12.3	12.1	12.6	12.4	12.8	11.5	10.1	8.0	8.5	9.4	9.6	9.9	10.0
Albany, N. Y.	6.8	6.6	6.9	7.0	6.7	7.1	7.5	8.0	8.0	8.0	8.8	9.1	9.7	9.4	9.1	8.4	7.5	7.5	6.9	6.4	6.0	6.4	6.7	7.0	7.6
Alpena, Mich.	8.7	8.8	8.2	8.0	8.3	8.3	8.2	8.4	8.8	9.0	9.3	11.2	11.3	11.5	11.5	11.0	10.5	9.9	9.9	10.4	10.4	9.9	9.7	9.1	9.6
Amarillo, Tex.	16.1	13.4	15.1	14.7	13.9	13.2	13.1	13.4	12.8	11.3	12.0	13.9	15.2	14.9	16.5	16.8	15.2	14.8	13.9	12.8	13.6	13.9	14.8	16.0	14.3
Atlanta, Ga.	11.5	11.3	11.0	10.6	11.0	11.2	10.6	11.2	11.5	12.0	12.8	12.6	13.2	13.1	13.5	12.9	12.1	10.5	10.0	10.8	11.0	11.5	11.7	11.3	11.6
Atlantic City, N. J.	11.4	12.1	12.0	12.6	12.5	12.5	12.1	11.8	12.3	12.9	14.0	14.3	15.5	14.8	14.7	13.5	12.0	11.0	10.7	10.6	10.3	10.4	10.8	10.6	12.3
Augusta, Ga.	6.4	6.3	5.8	6.3	5.7	5.6	5.3	5.3	5.8	7.2	7.9	8.1	8.7	9.0	9.4	9.4	8.2	6.7	6.1	5.8	6.1	5.8	5.1	5.5	6.9
Baker City, Oreg.	6.1	5.9	5.8	5.9	5.3	6.2	5.8	5.9	5.6	5.6	5.9	5.9	5.5	5.4	4.9	5.4	5.6	5.3	4.6	4.5	5.0	5.0	5.1	5.5	5.5
Baltimore, Md.	4.6	5.0	4.7	4.8	4.3	4.5	5.0	5.4	5.5	5.9	6.6	6.7	7.3	7.2	7.3	7.1	6.1	5.2	5.0	4.8	4.9	5.0	4.7	4.6	5.5
Bismarck, N. Dak.	4.8	5.5	6.1	5.6	5.5	5.6	6.7	6.7	6.1	6.3	6.4	7.5	8.7	10.0	11.1	11.9	11.9	9.8	7.8	6.6	6.4	6.7	5.9	5.1	7.3
Block Island, R. I.																									
Boston, Mass.	9.9	9.4	9.9	10.5	11.2	11.1	11.7	11.7	11.7	12.9	12.9	13.5	13.3	13.6	13.1	12.2	10.8	10.1	10.6	10.5	10.9	10.8	10.2	10.6	11.4
Buffalo, N. Y.	16.1	15.8	15.2	15.1	15.7	15.3	15.1	15.0	14.6	13.8	15.6	16.1	17.5	17.7	18.2	16.4	16.8	17.4	18.0	18.1	17.7	17.5	17.7	16.8	16.4
Calro, Ill.	9.3	9.7	9.3	9.6	9.8	9.4	9.7	9.7	9.7	10.1	11.0	11.2	11.4	11.3	11.5	11.2	10.7	10.4	9.4	9.3	9.8	9.6	9.3	9.3	10.1
Cape Henry, Va.	13.2	13.7	13.9	14.0	13.6	13.4	13.7	13.9	13.7	14.3	14.1	14.9	15.9	15.5	14.9	13.5	12.1	12.0	11.7	12.9	13.7	14.2	14.5	14.1	13.8
Carson City, Nev.	3.9	3.2	3.2	2.9	2.7	3.0	3.1	2.7	2.6	2.7	2.9	3.2	4.4	4.4	5.7	5.8	6.4	6.9	7.1	7.4	6.3	6.2	5.5	4.8	4.5
Charleston, S. C.	9.5	9.6	9.5	9.7	10.3	10.0	9.5	9.5	9.7	11.2	11.5	11.8	12.5	13.3	13.3	13.4	12.2	10.8	9.8	9.4	9.2	9.2	9.3	9.1	10.6
Charlotte, N. C.	7.5	7.5	7.4	7.3	6.1	6.3	6.2	6.0	6.7	8.3	8.5	8.8	9.0	9.2	10.2	9.9	9.1	8.0	7.4	7.8	8.4	7.9	7.8	8.1	7.9
Chattanooga, Tenn.	8.0	8.4	7.9	8.1	8.3	8.1	8.6	8.5	8.8	9.4	8.5	8.8	9.0	10.2	10.2	9.7	10.3	9.9	9.1	8.9	8.8	9.0	8.2	7.6	8.9
Cheyenne, Wyo.	9.2	9.5	9.5	10.6	11.5	11.1	11.0	11.4	11.8	10.9	11.0	11.7	14.0	14.3	14.3	15.4	15.5	14.7	12.8	10.2	8.7	8.0	8.9	9.4	11.5
Chicago, Ill.	16.4	15.4	15.9	16.8	16.5	17.0	16.9	16.0	16.2	17.0	17.8	18.3	19.2	18.7	19.3	19.2	20.1	20.1	20.9	19.9	18.4	17.6	16.5	16.7	17.8
Cincinnati, Ohio	9.6	9.5	9.4	8.7	8.6	8.5	9.6	10.1	10.3	10.3	11.4	11.3	12.1	12.1	11.8	11.8	11.9	11.1	10.3	10.3	10.3	10.3	10.3	10.3	10.4
Cleveland, Ohio	17.1	16.7	16.7	17.0	16.8	17.3	17.6	18.2	18.3	17.5	17.5	17.6	18.9	18.7	18.8	17.9	16.8	17.1	18.9	19.4	18.9	18.8	17.9	17.9	17.9
Columbia, Mo.	9.1	9.1	9.1	8.6	8.5	8.8	8.9	9.0	8.9	10.0	10.6	10.7	11.3	11.8	11.5	11.6	11.1	10.3	9.3	9.0	8.9	9.9	10.5	9.3	9.7
Columbus, Ohio	9.0	8.9	9.2	8.7	8.2	8.2	8.3	9.0	9.4	10.1	10.8	10.4	11.1	10.9	11.2	10.5	10.5	9.8	9.9	9.9	9.9	9.4	9.1	9.6	9.7
Concordia, Kans.	4.0	4.4	4.3	4.1	4.1	4.2	4.2	4.6	4.8	4.9	4.9	5.5	6.2	6.2	6.2	6.4	6.2	5.2	4.4	4.0	4.1	4.3	4.3	4.0	4.8
Corpus Christi, Tex.	10.1	9.3	8.5	7.7	8.5	9.0	9.8	9.1	8.1	8.3	9.8	11.3	12.9	13.2	14.3	15.0	14.8	13.8	12.2	10.9	9.6	9.7	9.4	9.4	10.6
Davenport, Iowa	6.6	6.5	6.9	6.7	6.2	6.5	6.3	7.1	7.3	7.5	7.9	8.2	9.4	9.6	9.9	9.3	8.9	8.2	7.5	6.7	7.5	7.5	6.7	6.2	7.6
Denver, Colo.	6.9	6.6	7.1	7.6	7.0	6.5	6.9	7.5	7.5	6.7	7.4	7.6	8.6	8.4	8.3	8.9	8.5	7.9	7.2	7.0	6.6	6.4	6.1	6.1	7.0
Des Moines, Iowa	6.6	6.0	6.0	6.1	6.3	6.1	6.4	6.5	6.7	6.7	7.4	7.6	8.6	8.4	8.3	8.9	8.5	7.9	7.2	7.0	6.6	6.4	6.1	6.1	7.0
Detroit, Mich.	9.8	9.6	9.6	9.3	10.1	9.7	9.6	9.6	10.0	10.5	11.2	12.0	12.9	13.2	13.5	13.4	12.7	11.7	11.5	10.8	11.3	10.8	10.7	10.8	11.0
Dodge City, Kans.	7.4	8.1	8.8	9.1	8.6	8.4	8.0	7.3	6.9	7.2	7.3	7.0	7.6	8.4	9.3	8.9	8.2	7.5	6.0	5.6	6.5	7.0	6.7	6.6	7.6
Dubuque, Iowa	6.5	5.9	5.8	6.4	6.1	5.8	6.3	6.2	6.4	7.2	7.9	8.2	8.7	8.5	8.4	8.3	7.8	7.2	6.5	6.7	6.7	6.5	6.3	6.1	6.9
Duluth, Minn.	8.2	8.4	8.0	8.1	7.2	7.8	6.9	7.6	8.3	9.3	8.2	8.2	8.9	8.3	7.6	7.6	7.6	6.8	6.8	7.8	8.5	8.2	7.8	7.5	7.9
Eastport, Me.	13.7	13.2	13.9	13.9	13.8	14.3	13.5	14.1	14.8	14.8	15.1	14.6	14.3	15.0	15.7	15.8	15.5	16.0	15.2	13.1	14.2	14.1	14.8	14.3	14.6
El Paso, Tex.	8.8	7.9	8.0	8.1	9.5	9.1	9.2	8.5	8.5	7.8	8.1	9.6	10.4	11.7	12.5	14.5	14.9	15.0	14.6	13.5	12.2	11.6	10.7	9.5	10.6
Erie, Pa.	14.1	13.3	13.4	13.0	12.8	13.0	13.9	13.5	13.5	13.1	13.4	12.7	13.6	13.4	12.9	13.6	12.3	11.5	12.2	12.7	12.9	13.7	14.8	14.6	13.2
Eureka, Cal.	3.3	3.6	3.4	3.1	3.3	3.4	3.5	3.3	4.0	4.1	4.5	3.9	4.1	4.5	6.2	8.3	9.2	10.2	10.3	9.3	7.6	5.6	5.4	4.5	5.4
Fort Canby, Wash.	14.0	14.0	12.6	12.2	12.6	13.1	13.2	13.7	13.2	13.2	14.1	14.8	16.4	16.0	14.4	12.8	12.8	12.6	13.0	14.0	13.7	12.8	13.8	13.3	13.6
Fort Smith, Ark.	7.0	7.0	7.5	7.0	7.0	7.5	7.5	7.8	7.8	8.1	7.9	8.9	8.4	8.9	9.1	9.3	8.2	7.0	6.5	6.5	6.6	7.0	7.1	7.1	7.7
Fresno, Cal.	4.0	4.2	4.1	4.6	4.6	4.1	4.0	4.3	3.9	3.5	4.0	4.0	4.9	5.1	5.2	5.4	5.4	5.2	5.1	4.2	4.0	3.9	3.7	3.6	4.4
Galveston, Tex.	11.8	12.0	11.5	11.0	10.5	10.1	11.4	12.0	12.1	12.1	12.1	12.8	12.8	12.8	11.8	11.4	11.7	11.8	11.1	10.3	10.4	11.2	11.0	10.8	11.5
Grand Haven, Mich.	10.4	10.0	10.1	10.1	10.8	11.1	10.9	10.9	10.9	11.0	11.6	12.2	13.2	13.1	13.1	12.8	11.9	11.1	10.9	10.5	10.3	10.9	11.1	10.9	11.2
Greenbay, Wis.	7.2	7.9	7.3	7.4	7.6	7.5	7.5	7.7	7.9	7.9	8.8	9.2	9.4	9.5	9.5	9.6	8.6	7.9	7.6	7.4	7.3	7.5	7.8	7.7	8.1
Hannibal, Mo.	8.9	7.9	7.8	8.2	8.5	8.3	8.4	8.2	8.2	8.4	9.6	10.5	11.9	11.8	12.0	12.7	11.3	9.9	9.4	8.8	8.7	8.6	9.0	9.0	9.4
Harrisburg, Pa.	8.3	8.3	8.4	8.7	9.0	8.8	8.7	8.6	8.9	9.4	10.1	11.0	10.8	10.8	10.7	11.1	10.0	9.4	9.0	8.5	9.0	8.9	8.8	8.8	9.3
Hatteras, N. C.	15.5	15.7	16.1	16.1	15.8	15.9	16.2	16.1	16.3	16.1	15.8	15.0	14.6	14.4	15.0	15.2	15.1	15.2	15.5	15.2	15.3	15.7	16.2	15.7	15.6
Havre, Mont.	9.5	9.4	9.7	10.2	9.8	9.3	10.3	9.9	9.6	10.8	11.0	11.4	11.4	12.8	13.5	13.5	12.5	11.0	10.3	9.6	9.4	9.6	9.6	9.3	10.7
Helena, Mont.	6.1	5.8	5.5	4.8	4.7	5.7	5.2	5.3	6.4	7.2	7.2	6.8	7.2	7.9	8.0	8.0	6.9	6.7	6.4	6.6	6.8	7.0	6.5	6.5	7.9
Huron, S. Dak.	10.0	9.6	9.5	8.9	8.4	8.0	7.7	7.7	8.4	8.6	9.5	10.8	11.6	11.6	12.0	11.8	11.9	10.1	8.7	9.1	9.4	9.5	10.1	9.9	9.7
Idaho Falls, Idaho	7.0	7.2	7.1	6.6	7.6	6.8	6.9	5.8	6.1	6.1	6.5	6.4	5.9	5.5	5.3	5.5	6.5	6.5	6.4	6.7	7.0	6.9	6.7	7.3	6.5
Indianapolis, Ind.	12.0	11.7	12.0	11.5	11.5	12.1	12.1	11.2	11.2	11.5	12.4	13.5	14.4	14.3	14.2	14.6	14.0	13.0	13.1	12.5	13.0	13.1	12.2	12.1	12.6
Jacksonville, Fla.	6.2	6.3	5.9	5.4	6.1	6.1	6.1	5.6	6.7	7.4	7.7	8.3	9.5	9.5	10.2	9.6	8.6	7.1	6.3	6.1	5.8	6.0	5.7	6.0	7.0
Jupiter, Fla.	7.3	7.3	7.5	8.1	8.3	7.9	8.4	8.6	8.7	10.2	10.9	11.3	11.6	12.1	12.4	12.1									

TABLE VI.—Average wind movement, etc.—Continued.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Pensacola, Fla.....	8.9	8.9	8.0	8.0	8.1	8.7	8.6	8.3	8.2	9.7	10.0	9.7	9.6	9.5	9.9	10.4	9.7	9.6	9.2	8.6	8.1	8.4	8.2	9.2	9.0
Philadelphia, Pa.....	9.4	10.3	10.7	10.7	10.7	10.3	10.4	10.6	11.0	11.0	11.8	11.8	11.8	12.1	11.9	11.1	10.5	9.5	9.5	9.5	9.8	9.7	9.7	9.2	10.5
Phoenix, Ariz.....	3.4	3.1	3.5	3.6	3.4	3.1	3.4	3.3	3.2	3.0	3.1	4.5	5.3	6.0	6.0	5.8	5.9	5.6	5.2	4.4	3.5	3.6	3.5	2.9	4.1
Pierre, S. Dak.....	5.5	5.5	4.5	5.3	4.6	4.6	5.2	5.1	5.7	5.4	5.8	7.0	7.8	8.6	9.7	10.3	10.0	9.4	8.3	6.5	5.5	5.2	5.1	5.3	6.5
Pittsburg, Pa.....	7.8	7.4	7.1	7.5	7.7	7.3	7.5	7.4	7.9	8.5	9.7	10.0	9.5	8.9	9.2	8.8	8.6	8.0	7.8	8.0	8.4	8.9	8.7	8.5	8.3
Port Angeles, Wash..	6.1	6.8	6.8	6.3	6.2	6.4	6.4	6.2	6.4	6.0	5.5	5.2	5.2	3.6	3.6	4.0	4.3	4.5	4.1	3.5	4.0	4.8	5.0	5.7	5.3
Port Huron, Mich.....	11.9	11.4	10.8	10.8	11.5	11.6	11.7	11.9	11.6	11.7	12.6	13.8	14.7	14.3	14.2	13.2	12.2	12.8	13.0	14.0	13.8	13.0	12.4	12.4	12.6
Portland, Me.....	7.6	7.2	7.1	7.2	7.4	7.4	7.5	7.4	7.6	8.0	8.4	8.4	8.6	8.8	7.9	7.5	6.6	6.5	6.3	6.8	7.2	7.7	7.7	7.6	7.5
Portland, Oreg.....	9.0	8.5	8.3	7.4	7.3	7.6	7.9	8.6	8.3	8.5	8.3	7.5	8.2	9.0	8.7	8.6	9.5	9.1	7.8	8.6	8.5	8.2	9.0	9.0	8.4
Pueblo, Colo.....	6.1	5.8	5.5	5.6	4.5	4.9	5.3	5.2	5.1	5.6	5.3	5.1	5.6	6.5	7.1	7.8	8.4	8.4	8.0	7.1	5.7	5.1	5.7	6.0	6.1
Raleigh, N. C.....	6.3	6.6	6.1	5.9	5.8	5.6	6.0	5.8	6.1	7.8	9.0	9.3	9.6	9.5	9.1	8.6	8.2	6.2	6.0	6.5	6.4	7.1	6.7	6.4	7.1
Rapid City, S. Dak....	5.6	6.0	6.6	7.3	7.2	7.3	7.3	7.1	6.7	7.5	7.2	5.9	5.5	5.8	7.1	7.6	7.1	6.5	5.9	4.6	4.8	4.6	4.7	5.2	6.3
Red bluff, Cal.....	4.8	4.9	4.8	5.0	4.5	5.2	4.8	4.7	4.7	4.7	4.9	4.8	5.0	5.9	6.1	6.5	6.4	6.5	6.6	6.2	5.8	5.7	5.3	4.8	5.4
Rochester, N. Y.....	8.6	8.5	8.3	9.0	9.0	8.6	8.6	9.2	8.6	9.0	9.1	9.0	9.2	9.5	9.2	9.0	8.7	7.9	8.3	8.6	8.7	9.4	9.3	9.2	8.9
Roseburg, Oreg.....	2.2	2.3	2.7	2.9	2.7	2.9	2.9	2.8	2.6	2.5	2.5	2.1	2.4	2.7	3.0	3.4	4.0	3.9	3.7	3.3	2.4	2.4	2.1	2.4	2.8
Sacramento, Cal.....	9.3	8.9	8.6	8.9	8.7	7.9	7.6	7.3	7.5	7.2	7.3	7.4	7.9	8.5	9.1	9.7	9.4	9.5	9.1	8.3	8.8	8.6	8.8	8.5	8.4
St. Louis, Mo.....	10.3	10.2	10.5	9.9	9.5	9.6	10.0	10.1	10.6	10.7	11.7	12.7	13.3	12.8	13.3	13.1	12.5	11.9	11.4	11.2	11.5	10.7	10.5	11.2	11.2
St. Paul, Minn.....	6.7	6.4	6.3	6.1	6.1	6.2	6.2	6.5	6.6	6.8	6.7	7.0	7.8	7.7	8.5	8.5	8.8	7.9	7.4	7.4	7.2	7.4	6.9	6.7	7.1
Salt Lake City, Utah..	3.3	3.3	3.4	3.5	3.2	3.7	3.5	3.6	3.6	4.0	3.7	4.0	5.2	5.5	6.0	6.6	6.3	5.7	5.3	3.7	3.5	3.5	4.0	4.0	4.3
San Antonio, Tex.....	7.1	8.3	8.9	8.8	8.5	8.0	7.9	7.5	7.7	7.7	9.5	10.4	10.3	10.9	11.3	10.5	10.8	10.4	9.4	7.3	8.5	8.3	7.5	7.1	8.9
San Diego, Cal.....	4.7	4.5	5.1	5.0	5.1	5.5	5.2	5.4	5.6	6.0	4.7	4.5	4.7	5.5	6.9	7.8	7.9	8.8	8.4	7.2	5.3	4.4	4.3	4.9	5.7
Sandusky, Ohio.....	10.0	10.1	10.2	10.1	10.7	10.3	10.6	10.8	9.8	10.9	11.1	12.3	12.3	12.0	11.6	11.0	11.0	10.8	10.5	10.6	10.9	10.8	10.3	9.2	10.7
San Francisco, Cal....	7.8	7.2	6.6	6.7	6.5	5.8	6.4	6.8	6.5	6.5	7.0	6.9	8.3	8.2	8.0	8.0	8.5	8.2	8.0	7.7	8.0	8.2	8.7	8.7	7.5
San Luis Obispo, Cal..	3.1	3.1	2.6	2.6	2.7	2.8	2.7	3.4	3.8	3.2	2.8	3.1	4.4	5.7	7.3	7.5	7.8	8.0	7.5	6.6	5.2	4.3	4.1	3.8	4.5
Santa Fe, N. Mex.....	3.6	3.5	4.1	4.5	4.8	4.6	4.8	5.5	6.0	5.9	6.4	7.9	8.4	9.0	8.9	9.1	8.3	8.0	5.5	3.7	3.8	3.8	4.1	3.9	5.8
Sault Ste Marie, Mich.	7.5	7.6	7.8	7.7	8.0	8.0	8.5	8.8	8.7	9.0	9.7	9.6	10.3	10.1	10.2	10.6	10.6	9.8	8.5	8.3	7.1	7.1	7.1	7.3	8.7
Savannah, Ga.....	8.2	8.1	8.0	8.5	8.3	8.3	8.5	8.9	8.7	9.7	9.6	10.7	11.2	10.9	11.1	11.5	10.0	8.2	7.6	7.7	8.0	8.4	8.7	8.5	9.1
Seattle, Wash.....	6.3	5.8	5.7	5.6	5.2	5.0	5.0	5.0	5.4	5.5	6.1	5.8	6.1	6.5	6.3	7.0	6.9	6.7	6.6	6.7	6.7	6.8	6.5	6.4	6.1
Shreveport, La.....	8.6	7.5	7.5	7.4	6.8	6.8	7.0	7.8	7.9	7.9	8.7	9.8	9.6	9.4	9.9	10.0	9.5	8.5	8.2	8.3	8.2	8.4	8.4	8.4	8.4
Sioux City, Iowa.....	8.9	9.0	9.3	9.5	9.8	9.1	9.5	9.8	9.9	9.5	9.2	10.1	11.8	12.2	12.9	12.4	11.8	11.3	10.1	9.4	9.3	9.4	9.5	9.2	10.1
Spokane, Wash.....	4.1	4.5	3.8	4.6	3.9	4.3	3.7	3.5	3.5	3.7	3.4	3.6	3.8	4.3	4.7	4.7	4.8	4.7	4.2	3.7	3.6	3.6	3.9	3.9	4.1
Springfield, Ill.....	9.6	9.5	9.6	9.4	9.6	9.3	9.7	9.6	10.4	10.4	10.0	10.5	11.4	12.5	12.5	12.7	11.9	10.9	10.2	10.1	10.3	10.1	10.0	9.2	10.4
Springfield, Mo.....	11.5	11.7	11.9	11.9	11.6	11.2	11.3	12.0	12.0	12.6	13.0	13.9	13.7	12.6	12.9	13.0	12.5	11.7	11.1	10.7	10.8	11.1	11.2	10.7	11.9
Tacoma, Wash.....	5.1	5.3	5.5	6.1	5.5	4.7	4.9	5.4	4.7	4.3	4.6	4.5	4.5	5.9	6.8	6.9	7.5	7.3	7.3	7.1	6.8	6.3	6.4	6.1	5.8
Tampa, Fla.....	5.0	4.7	5.1	5.4	5.7	5.0	5.7	5.6	5.6	6.5	7.3	7.4	8.2	8.0	8.0	8.1	7.9	6.4	5.7	4.7	4.1	3.9	4.4	4.2	5.9
Tatoosh Island, Wash..	14.6	15.8	16.5	14.6	15.2	15.1	14.1	14.8	14.3	14.4	14.6	15.1	13.8	14.6	13.5	14.0	14.0	14.4	14.1	14.2	13.3	14.4	14.2	14.4	14.5
Toledo, Ohio.....	10.1	10.1	10.0	10.3	10.2	10.1	10.2	10.1	10.0	10.5	11.7	12.6	13.3	13.7	13.3	13.4	12.6	11.8	12.0	11.1	11.2	11.0	10.6	10.4	11.3
Vicksburg, Miss.....	10.0	9.6	8.7	9.1	9.6	9.1	8.6	8.5	8.7	9.0	9.5	9.2	9.3	9.5	9.5	9.6	9.3	8.6	7.9	8.4	8.6	9.3	9.5	9.4	9.1
Vineyard Haven, Mass.	8.9	9.4	9.7	9.4	9.0	9.8	9.5	9.7	10.3	10.5	11.4	11.5	11.2	11.1	10.4	9.7	8.8	9.1	9.5	9.1	9.5	10.1	10.4	10.2	9.9
Walla Walla, Wash....	4.9	4.3	4.4	4.4	4.8	4.9	4.8	4.7	4.4	4.4	4.5	4.5	4.9	5.8	6.0	5.8	5.7	5.5	4.9	4.4	4.5	4.6	5.0	5.0	4.9
Washington, D. C.....	6.2	6.1	6.5	6.6	6.5	6.6	6.5	6.0	6.3	8.4	9.9	10.6	10.6	11.0	10.5	9.2	8.4	7.2	6.6	6.4	6.5	6.8	6.4	6.3	7.6
Wichita, Kans.....	6.7	6.5	6.1	6.1	6.6	7.0	7.6	7.9	8.1	8.1	8.7	8.9	10.0	9.8	9.6	9.5	8.7	8.1	7.0	6.6	6.9	7.4	7.0	6.5	7.7
Williston, N. Dak.....	6.3	5.6	5.6	5.2	5.0	5.2	5.4	4.7	5.2	5.3	5.3	5.9	8.3	9.2	10.3	11.0	10.5	8.9	7.2	6.2	5.6	5.5	5.7	5.8	6.6
Wilmington, N. C.....	8.6	8.7	8.6	8.4	8.9	8.8	8.5	8.3	9.1	10.4	11.2	11.4	11.5	12.2	12.0	11.8	11.1	9.2	8.6	8.5	8.6	8.3	8.5	8.5	9.6
Woods Hole, Mass.....	16.5	15.5	17.5	16.6	16.6	16.7	16.9	17.7	18.5	18.1	18.0	17.5	17.5	17.5	17.2	16.2	15.9	15.4	15.8	16.1	17.3	16.9	18.5	18.1	17.1
Yankton, S. Dak.....	7.0	7.2	6.6	6.0	6.2	6.7	6.5	6.9	7.2	7.1	7.0	7.2	7.9	8.9	9.0	8.9	8.3	7.5	6.4	6.7	6.4	6.8	7.1	6.5	7.2

TABLE VII.—Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of January, 1898.

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
<i>New England.</i>	<i>Hours.</i>	<i>Hours.</i>	<i>Hours.</i>	<i>Hours.</i>	<i>°</i>	<i>Hours.</i>
Eastport, Me.	29	8	9	27	n. 41 w.	28
Portland, Me.	31	9	3	29	n. 50 w.	34
Northfield, Vt.	24	32	2	8	s. 37 w.	10
Boston, Mass.	23	13	8	34	n. 69 w.	28
Nantucket, Mass.	29	14	10	25	n. 45 w.	21
Woods Hole, Mass.*	9	8	5	17	n. 85 w.	12
Block Island, R. I.	28	10	14	28	n. 38 w.	32
New Haven, Conn.	38	6	10	19	n. 16 w.	33
<i>Middle Atlantic States.</i>						
Albany, N. Y.	27	19	5	19	n. 60 w.	16
Binghamton, N. Y.†	12	3	12	11	n. 6 e.	9
New York, N. Y.	25	9	15	29	n. 41 w.	21
Harrisburg, Pa.	16	12	21	26	n. 51 w.	6
Philadelphia, Pa.	26	11	12	27	n. 45 w.	21
Atlantic City, N. J.	26	9	13	29	n. 43 w.	23
Baltimore, Md.	14	11	17	29	n. 76 w.	12
Washington, D. C.	28	13	13	22	n. 31 w.	18
Lynchburg, Va.	23	15	17	27	n. 51 w.	13
Norfolk, Va.	25	15	23	19	n. 22 e.	11
Richmond, Va.	8	9	5	13	s. 83 w.	8
<i>South Atlantic States.</i>						
Charlotte, N. C.	16	27	18	19	s. 5 w.	11
Hatteras, N. C.	27	14	10	23	n. 45 w.	18
Raleigh, N. C.	18	13	11	30	n. 81 w.	19
Wilmington, N. C.	13	18	13	32	s. 75 w.	20
Charleston, S. C.	22	15	8	30	n. 72 w.	23
Augusta, Ga.	9	21	11	35	s. 63 w.	27
Savannah, Ga.	14	22	10	30	s. 68 w.	22
Jacksonville, Fla.	16	23	9	28	s. 70 w.	20
<i>Florida Peninsula.</i>						
Jupiter, Fla.	18	22	13	20	s. 60 w.	8
Key West, Fla.	24	9	37	6	n. 64 e.	34
Tampa, Fla.	23	16	12	25	n. 62 w.	15
<i>Eastern Gulf States.</i>						
Atlanta, Ga.	18	20	11	31	s. 84 w.	20
Pensacola, Fla.	24	23	14	16	n. 63 w.	2
Mobile, Ala.	22	22	11	19	w.	8
Montgomery, Ala.	19	19	13	25	w.	12
Vicksburg, Miss.	18	24	20	11	s. 56 e.	11
New Orleans, La.	25	22	15	11	n. 53 e.	5
<i>Western Gulf States.</i>						
Shreveport, La.	15	23	24	20	s. 27 e.	9
Fort Smith, Ark.	10	10	31	20	e.	11
Little Rock, Ark.	12	18	17	25	s. 53 w.	10
Corpus Christi, Tex.	21	17	26	12	n. 74 e.	15
Galveston, Tex.	18	22	24	13	s. 70 e.	12
Palestine, Tex.	21	22	17	13	s. 76 e.	4
San Antonio, Tex.	31	16	23	9	n. 43 e.	20
<i>Ohio Valley and Tennessee.</i>						
Chattanooga, Tenn.	21	23	13	25	s. 81 w.	12
Knoxville, Tenn.	17	18	14	28	s. 86 w.	14
Memphis, Tenn.	12	19	20	21	s. 8 w.	7
Nashville, Tenn.	19	20	14	24	s. 84 w.	10
Lexington, Ky.	8	20	20	28	s. 34 w.	14
Louisville, Ky.	11	22	17	23	s. 36 w.	14
Indianapolis, Ind.	13	17	14	33	s. 78 w.	19
Cincinnati, Ohio	10	16	23	25	s. 18 w.	6
Columbus, Ohio	11	17	17	31	s. 67 w.	15
Pittsburg, Pa.	6	31	11	28	s. 34 w.	30
Parkersburg, W. Va.	21	20	15	22	n. 82 w.	7
<i>Lower Lake Region.</i>						
Buffalo, N. Y.	8	18	15	30	s. 56 w.	18
Oswego, N. Y.	18	27	16	15	s. 6 e.	9
Rochester, N. Y.	13	26	8	33	s. 63 w.	28
Erie, Pa.	10	22	9	27	s. 56 w.	22
Cleveland, Ohio	11	24	17	28	s. 40 w.	17
Sandusky, Ohio	13	21	9	30	s. 69 w.	22
Toledo, Ohio	10	18	14	30	s. 63 w.	18
Detroit, Mich.	12	18	16	29	s. 65 w.	14
<i>Upper Lake Region.</i>						
Alpena, Mich.	20	16	6	32	n. 81 w.	26
Grand Haven, Mich.	22	14	23	17	n. 37 e.	10
Marquette, Mich.	22	17	3	33	n. 81 w.	30
Port Huron, Mich.	15	26	12	23	s. 45 w.	16
Sault Ste. Marie, Mich.	22	13	27	15	n. 53 e.	15
Chicago, Ill.	17	20	11	26	s. 79 w.	15
Milwaukee, Wis.	30	17	10	31	n. 82 w.	21
<i>Upper Lake Region—Cont'd.</i>						
Greenbay, Wis.	18	11	3	20	n. 68 w.	18
Duluth, Minn.	19	21	5	33	s. 86 w.	28
<i>North Dakota.</i>						
Moorhead, Minn.	21	22	17	19	s. 6 w.	2
Bismarck, N. Dak.	27	12	13	36	n. 41 w.	20
Williston, N. Dak.	17	27	1	33	s. 73 w.	34
<i>Upper Mississippi Valley.</i>						
St. Paul, Minn.	21	22	11	23	s. 85 w.	12
La Crosse, Wis.†	9	16	5	9	s. 30 w.	8
Davenport, Iowa	18	10	19	29	n. 51 w.	13
Des Moines, Iowa	28	12	16	20	n. 14 w.	16
Dubuque, Iowa	17	17	15	30	w.	15
Keokuk, Iowa	12	18	20	27	s. 49 w.	9
Cairo, Ill.	20	23	16	19	s. 45 w.	4
Springfield, Ill.	17	20	13	26	s. 77 w.	13
Hannibal, Mo.†	8	8	10	12	w.	2
St. Louis, Mo.	14	17	20	25	s. 59 w.	6
<i>Missouri Valley.</i>						
Columbia, Mo.*	7	5	10	15	n. 68 w.	5
Kansas City, Mo.	24	12	18	23	n. 23 w.	13
Springfield, Mo.	20	26	17	18	s. 9 w.	6
Lincoln, Nebr.	18	24	18	16	s. 18 e.	6
Omaha, Nebr.	23	17	9	24	n. 68 w.	16
Sioux City, Iowa†	9	13	6	10	s. 45 w.	6
Pierre, S. Dak.	17	21	18	21	s. 37 w.	5
Huron, S. Dak.	20	20	17	20	w.	3
Yankton, S. Dak.†	6	9	6	16	s. 73 w.	10
<i>Northern Slope.</i>						
Havre, Mont.	9	22	9	41	s. 68 w.	34
Miles City, Mont.	7	38	9	21	s. 21 w.	33
Helena, Mont.	10	30	2	41	s. 63 w.	44
Rapid City, S. Dak.	17	10	10	39	n. 76 w.	30
Cheyenne, Wyo.	25	14	2	35	n. 72 w.	35
Lander, Wyo.	9	35	14	17	s. 7 w.	26
North Platte, Nebr.	17	11	9	37	n. 78 w.	29
<i>Middle Slope.</i>						
Denver, Colo.	19	27	14	15	s. 7 w.	8
Pueblo, Colo.	24	8	14	27	n. 39 w.	21
Concordia, Kans.	18	19	12	23	s. 85 w.	11
Dodge City, Kans.	20	14	10	29	n. 72 w.	20
Wichita, Kans.	30	16	14	18	n. 16 w.	15
Oklahoma, Okla.	28	18	12	18	n. 31 w.	12
<i>Southern Slope.</i>						
Abilene, Tex.	17	24	10	24	s. 63 w.	16
Amarillo, Tex.	21	26	3	16	s. 69 w.	14
<i>Southern Plateau.</i>						
El Paso, Tex.	27	5	12	35	n. 46 w.	32
Santa Fe, N. Mex.	33	13	22	10	n. 31 e.	23
Phoenix, Ariz.	14	9	26	22	n. 39 e.	6
Yuma, Ariz.	34	6	14	16	n. 4 w.	28
<i>Middle Plateau.</i>						
Carson City, Nev.	22	20	22	16	n. 72 e.	6
Winnemucca, Nev.	14	26	14	21	s. 30 w.	14
<i>Northern Plateau.</i>						
Baker City, Oreg.	9	42	13	9	s. 7 e.	33
Idaho Falls, Idaho	40	15	2	13	n. 24 w.	27
Spokane, Wash.	15	24	19	14	s. 29 e.	10
Walla Walla, Wash.	4	43	6	18	s. 17 w.	41
<i>North Pacific Coast Region.</i>						
Fort Canby, Wash.	11	14	29	13	s. 79 e.	16
Port Angeles, Wash.*	1	10	11	15	s. 24 w.	10
Seattle, Wash.	9	31	22	11	s. 26 e.	25
Tacoma, Wash.	11	33	12	23	s. 26 w.	25
Tatoosh Island, Wash.	6	22	23	14	s. 29 e.	18
Portland, Oreg.	12	27	17	21	s. 15 w.	16
Roseburg, Oreg.	20	17	21	18	n. 45 e.	4
<i>Middle Pacific Coast Region.</i>						
Eureka, Cal.	21	17	20	18	n. 27 e.	4
Redbluff, Cal.	37	9	10	17	n. 14 w.	29
Sacramento, Cal.	30	21	12	11	n. 6 e.	9
San Francisco, Cal.	31	8	8	23	n. 33 w.	28
<i>South Pacific Coast Region.</i>						
Fresno, Cal.	21	8	22	23	n. 4 w.	13
Los Angeles, Cal.	25	10	17	24	n. 25 w.	17
San Diego, Cal.	23	12	20	23	n. 15 w.	11
San Luis Obispo, Cal.	38	10	4	16	n. 23 w.	30

* From observations at 8 p. m. only.

† From observations at 8 a. m. only.

TABLE VIII.—Thunderstorms and auroras, January, 1898.

States.	No. of stations.																																Total.			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	No.	Days.		
Alabama.....	52	T.									1	3		1		1				2		3	2		2	1							16	9	T.	
Arizona.....	52	A.			1						1	1																					0	4	A.	
Arkansas.....	61	T.				1	2	4				3	30	11	1	6				1	5		3	12		4	2						75	14	T.	
California.....	181	A.																1															0	2	A.	
Colorado.....	75	T.																															0	0	T.	
Connecticut.....	30	A.												1	1						2			5									2	7	A.	
Delaware.....	5	T.															1				1												2	0	T.	
Dist. of Columbia	4	A.																															0	0	A.	
Florida.....	45	T.																															0	0	T.	
Georgia.....	62	A.							1	1		1	7				1						2	2	1		6						3	0	A.	
Idaho.....	30	T.																															0	0	T.	
Illinois.....	92	A.								1	28	2	9	17							1	1		2		24							85	9	A.	
Indiana.....	54	T.			1				1		8	1		1						1			1		1	2	1				1		30	7	T.	
Indian Territory.	7	A.			2													2															4	1	A.	
Iowa.....	122	T.											3																				3	0	T.	
Kansas.....	85	A.										20																					20	1	A.	
Kentucky.....	52	T.							1	1		12						2								1	6						21	5	T.	
Louisiana.....	50	A.									12		2								3			16									45	5	A.	
Maine.....	16	T.				1						2	1	3		2	1			3	7	4	9	9	1	2							45	0	T.	
Maryland.....	35	A.	1																														2	1	A.	
Massachusetts.....	50	T.																			1	1			1	14							16	2	T.	
Michigan.....	112	A.																1				3			1	1							4	1	A.	
Minnesota.....	69	T.										12								1	1												12	3	T.	
Mississippi.....	46	A.					1																										10	6	A.	
Missouri.....	95	T.					1				2	2	1			3	1				10	3	5	9			2		1				40	0	T.	
Montana.....	37	A.																															109	7	A.	
Nebraska.....	143	T.	1																														20	0	T.	
Nevada.....	48	A.																															3	0	A.	
New Hampshire.....	16	T.																															6	2	T.	
New Jersey.....	55	A.		1																													20	3	A.	
New Mexico.....	39	T.																															0	0	T.	
New York.....	103	A.																															0	0	A.	
North Carolina.....	59	T.										1	30	3	2																		29	6	T.	
North Dakota.....	46	A.										2																					8	3	A.	
Ohio.....	135	T.																															27	13	T.	
Oklahoma.....	23	A.	1				1						31	4																			105	5	A.	
Oregon.....	62	T.																															13	4	T.	
Pennsylvania.....	105	A.																															1	0	A.	
Rhode Island.....	1	T.																															34	0	T.	
South Carolina.....	43	A.																															2	1	A.	
South Dakota.....	44	T.																															10	5	T.	
Tennessee.....	65	A.																															5	5	A.	
Texas.....	85	T.																															52	0	T.	
Utah.....	41	A.																															18	8	A.	
Vermont.....	15	T.																															0	0	T.	
Virginia.....	49	A.																															5	1	A.	
Washington.....	50	T.																															11	0	T.	
West Virginia.....	35	A.																															0	0	A.	
Wisconsin.....	61	T.																															15	2	T.	
Wyoming.....	14	A.																															0	0	A.	
Sums.....	2,851	T.	1	0	1	1	4	5	1	0	3	78	25	141	138	17	15	6	1	1	10	37	40	23	81	15	19	22	3	3	0	0	6	887	T.
		A.	2	1	0	3	2	1	0	3	0	3	0	3	4	5	4	4	26	9	15	5	3	1	1	1	2	7	3	0	4	1	0	115	A.

TABLE IX.—Average hourly sunshine (in percentages), January, 1898.

Stations.	Instrument.	Percentages for each hour of local mean time ending with the respective hour.																Hours of sunshine.			
		A. M.								P. M.								Total.			
		5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	Actual.	Possible.	Percent of possible.	Personal estimate.
Albany, N. Y.	T.				10	13	29	41	50	56	55	46	40	30	44			111.9	222.7	38	26
Atlanta, Ga.	T.			0	23	26	28	41	44	46	45	41	38	39	37			116.9	316.2	37	37
Atlantic City, N. J.	P.				35	37	47	54	52	52	51	49	48	44	43			143.2	303.8	47	40
Baltimore, Md.	T.				20	37	54	66	73	75	67	65	53	45	50			171.2	303.8	56	43
Binghamton, N. Y.	T.				3	9	29	46	55	55	54	50	32	12	15			106.7	235.5	36	32
Bismarck, N. Dak.	P.				69	69	66	66	65	66	72	77	64	65	100			190.0	279.9	68	67
Boston, Mass.	T.				33	48	53	64	64	63	62	59	55	47	31			164.5	295.5	56	48
Buffalo, N. Y.	T.				3	11	22	35	45	51	44	36	30	6	0			84.1	232.7	29	19
Charleston, S. C.	T.			17	28	36	52	64	66	73	60	61	54	52	42			173.2	318.5	54	51
Chattanooga, Tenn.	T.			0	10	13	25	41	44	44	41	42	34	30	12			97.9	314.6	31	39
Cheyenne, Wyo.	P.				59	69	76	78	73	72	71	65	68	62	71			207.8	298.4	70	55
Chicago, Ill.	T.				37	39	50	59	66	63	54	45	35	30	28			142.8	295.5	48	48
Cincinnati, Ohio	T.				25	24	30	39	53	54	47	51	48	44	33			127.1	303.8	42	39
Cleveland, Ohio	T.				12	18	28	36	40	39	36	39	30	15	8			82.9	295.5	28	22
Columbus, Ohio	T.				29	20	25	34	35	28	31	26	23	25	33			81.2	301.1	27	27
Denver, Colo.	P.				52	60	74	74	82	74	72	70	71	55	50			207.2	301.1	69	55
Des Moines, Iowa	T.				46	47	51	49	52	54	57	56	53	55	69			154.7	295.5	52	52
Detroit, Mich.	T.				12	19	39	47	53	53	52	42	25	21	31			110.6	295.5	37	24
Dodge City, Kans.	P.				48	61	60	66	71	59	61	61	52	45	44			179.3	306.5	58	55
Dubuque, Iowa	T.				34	33	40	50	56	56	57	53	45	45	46			140.2	295.5	47	50
Eastport, Me.	P.				35	39	49	58	60	50	53	47	47	42	33			140.4	286.7	49	36
Erie, Pa.	T.				0	6	11	25	31	31	28	22	11	9	0			53.3	295.5	18	18
Eureka, Cal.	P.				33	37	46	52	49	59	57	61	55	46	41			149.4	298.4	50	40
Fresno, Cal.	T.				16	35	57	65	62	66	69	69	55	46	44			168.6	309.0	55	46
Galveston, Tex.	P.			27	26	35	41	45	48	52	52	47	46	42	34			139.9	326.8	43	41
Harrisburg, Pa.	T.				14	34	48	63	71	68	65	58	45	29	8			148.8	301.1	49	29
Helena, Mont.	P.				39	38	49	58	53	58	55	36	35	48	100			133.3	279.9	48	46
Huron, S. Dak.	T.				56	55	63	70	75	82	79	77	65	51	83			197.6	290.7	68	59
Idaho Falls, Idaho	T.				47	45	64	92	97	96	85	74	54	39	56			207.4	292.7	71	42
Indianapolis, Ind.	T.				23	20	24	30	38	45	41	41	35	40	46			102.2	301.1	34	31
Jacksonville, Fla.	T.																				57
Kansas City, Mo.	P.				34	25	33	41	44	41	44	47	42	47	60			121.7	303.8	40	38
Key West, Fla.	T.			59	65	71	77	73	78	83	82	87	77	78	83			257.4	334.2	77	69
Knoxville, Tenn.	T.				23	28	45	50	51	50	48	50	43	32	36			130.8	311.8	42	43
Little Rock, Ark.	T.			0	32	36	41	44	47	45	38	39	34	38	41			124.4	314.6	40	30
Los Angeles, Cal.	P.			60	65	63	70	70	64	67	66	61	58	65	65			205.3	316.2	65	56
Louisville, Ky.	T.																	306.5			30
Minneapolis, Minn.	T.				27	28	28	35	42	46	46	37	35	38	67			105.2	286.7	37	
Nashville, Tenn.	T.				30	31	42	44	50	57	53	48	44	32	27			133.9	311.8	43	38
New Orleans, La.	T.			29	23	34	52	55	59	59	55	58	50	45	36			157.1	324.9	48	48
New York, N. Y.	T.				21	29	40	54	56	55	57	54	47	33	41			135.6	298.4	45	40
Northfield, Vt.	P.				37	40	45	42	44	53	49	50	38	29	33			125.2	289.7	43	37
Oklahoma, Okla.	T.			0	45	45	56	58	64	67	65	59	49	37	36			171.0	314.6	54	50
Omaha, Nebr.	P.				45	45	47	60	59	53	54	57	54	49	59			156.9	298.4	53	50
Parkersburg, W. Va.	T.				10	11	13	17	23	28	28	18	15	16	10			56.2	303.8	18	19
Philadelphia, Pa.	T.				19	25	44	48	48	49	45	43	41	36	33			121.5	301.1	40	34
Phoenix, Ariz.	P.			30	40	50	60	63	65	71	71	73	64	61	53			196.2	318.5	62	57
Pittsburg, Pa.	T.				0	2	15	35	34	34	35	32	17	11	29			66.6	298.4	22	18
Portland, Me.	T.				24	29	48	57	66	68	69	65	47	32	33			152.4	280.7	53	49
Portland, Oreg.	T.				9	12	21	36	45	47	41	35	25	22	0			87.2	283.1	31	29
Raleigh, N. C.	T.				20	34	52	58	64	63	61	57	55	38	39			156.9	311.8	50	43
Rochester, N. Y.	T.				0	1	12	19	27	23	30	24	16	11	22			50.1	292.7	17	16
St. Louis, Mo.	T.				36	41	55	57	62	66	66	56	51	38	40			161.7	303.8	53	42
St. Paul, Minn.	P.				36	38	49	48	50	53	57	57	54	51	67			144.0	286.7	60	50
Salt Lake City, Utah	P.				40	39	47	53	56	51	56	56	40	36	53			142.8	298.4	48	49
San Diego, Cal.	P.			74	66	64	73	75	70	73	72	74	71	60	60			221.5	318.5	70	63
San Francisco, Cal.	T.				28	52	75	79	83	81	84	75	58	48	46			204.9	306.5	67	44
Santa Fe, N. Mex.	P.				41	57	58	60	57	57	61	58	56	45	37			170.7	311.8	55	55
Savannah, Ga.	P.			50	43	58	60	63	65	65	69	62	58	52	46			189.2	320.5	59	58
Seattle, Wash.	T.				4	6	11	26	35	37	30	26	14	13				60.2	276.2	22	28
Spokane, Wash.	T.				8	7	9	19	23	26	22	21	22	24				51.3	276.2	19	18
Tacoma, Wash.	T.				9	9	9	25	37	38	33	26	18	19	0			65.8	279.9	24	20
Tampa, Fla.	T.			65	68	58	70	83	81	81	81	75	62	68	67			237.9	328.7	72	68
Vicksburg, Miss.	T.			25	17	30	38	49	61	62	58	49	46	32	13			138.4	320.5	43	44
Washington, D. C.	P.				35	44	45	55	45	48	54	49	47	46	53			143.3	303.8	47	49
Wilmington, N. C.	T.			10	35	64	73	74	75	72	77	74	70	61	44			212.3	316.2	67	64
Yankton, S. Dak.	T.				50	55	66	81	87	86	80	72	68	58	78			209.0	292.7	71	67

TABLE X.—Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during January, 1898, at all stations furnished with self-registering gauges.

Stations.	Date.	Total duration.		Total amt of precipi- tation.	Excessive rate.		Amount be- fore exces- sive began.	Depths of precipitation (in inches) during periods of time as indicated.													
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
Albany, N. Y.*	1	2	3	4	5	6	7														
Atlanta, Ga.	20			0.63														0.47			
Atlantic City, N. J.†																					
Baltimore, Md.†																					
Binghamton, N. Y.	22-23			0.62														0.13			
Bismarck, N. Dak.*																					
Boston, Mass.	22-23			0.93														0.18			
Buffalo, N. Y.	20			0.78														0.28			
Cairo, Ill.	19-20			2.36														0.41			
Charleston, S. C.	16			0.15														0.08			
Chicago, Ill.	20			1.13														0.39			
Cincinnati, Ohio	19-20			2.34														0.48			
Cleveland, Ohio	19-20			0.87														0.27			
Columbia, Mo.	11-12			0.49														0.36			
Columbus, Ohio	19-20			1.22														0.27			
Denver, Colo.	20-21			0.15														0.02			
Des Moines, Iowa	24-25			0.35														0.13			
Detroit, Mich.	19-20			0.92														0.22			
Dodge City, Kans.*																					
Duluth, Minn.*																					
Eastport, Me.	8			0.94														0.25			
Erie, Pa.	19-20			0.74														0.18			
Fresno, Cal.	6-7			0.17														0.06			
Galveston, Tex.	17-18	11.30 p.m.	2.57 p.m.	2.63	12.23 p.m.	1.16 p.m.	1.44	0.08	0.16	0.24	0.31	0.43	0.59	0.76	0.96	1.06	1.11	1.17			
Harrisburg, Pa.	22-23			0.85														0.15			
Hatteras, N. C.	6			0.32														0.27			
Huron, S. Dak.*																					
Idaho Falls, Idaho*																					
Indianapolis, Ind.	22-23			0.93														0.22			
Jacksonville, Fla.	30-31			0.20														0.07			
Jupiter, Fla.	9			0.13														0.09			
Kansas City, Mo.	11-12	6.50 p.m.	7.35 a.m.	1.50	7.40 p.m.	8.25 p.m.	0.50	0.13	0.34	0.51	0.61	0.71	0.75	0.79							
Key West, Fla.	31			0.20											0.15						
Knoxville, Tenn.	11			2.57														0.43			
Lincoln, Nebr.*																					
Little Rock, Ark.	11			0.60						0.40											
Los Angeles, Cal.																					
Louisville, Ky.	22-23			2.55														0.33			
Memphis, Tenn.	21-22			2.65														0.73			
Milwaukee, Wis.	20			0.94														0.22			
Montgomery, Ala.	10			0.29														0.18			
Nantucket, Mass.	20			0.70														0.25			
Nashville, Tenn.	11	4.45 a.m.	5.10 p.m.	2.43	6.15 a.m.	7.00 a.m.	0.06	0.05	0.11	0.16	0.21	0.29	0.43	0.54	0.60	0.65					
New Orleans, La.	24			0.19														0.14			
New York, N. Y.	22-23			1.39														0.30			
Norfolk, Va.	11-12			0.43														0.23			
Northfield, Vt.*																					
Oklahoma, Okla.																					
Omaha, Nebr.	24-25			0.23														0.08			
Parkersburg, W. Va.	22-23			1.66														0.25			
Philadelphia, Pa.	22-23			1.22														0.25			
Pittsburg, Pa.*	22-23			0.67																	
Portland, Me.	20			1.26														0.34			
Portland, Oreg.	18			0.68														0.14			
Raleigh, N. C.	25			0.74														0.16			
Rochester, N. Y.	22-23			0.61														0.20			
St. Louis, Mo.	11-12			0.54					0.36												
St. Paul, Minn.	18-19			0.03														0.02			
Salt Lake City, Utah*																					
San Diego, Cal.	12			0.40														0.17			
San Francisco, Cal.	11			0.33														0.12			
Savannah, Ga.	16			0.14														0.03			
Seattle, Wash.	7-8			0.25														0.11			
Spokane, Wash.*																					
Tampa, Fla.	31			0.16														0.15			
Vicksburg, Miss.	13-14			0.97														0.49			
Washington, D. C.	14-15			1.03														0.17			
Wilmington, N. C.	23			0.57														0.16			
Yankton, S. Dak.*																					

* Record incomplete on account of snow.

† Self-register out of order.

TABLE XI.—Excessive precipitation, by stations, for January, 1898.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Arkansas.</i>						
Arkansas City	<i>Inches.</i>	<i>Inches.</i>		<i>Ins.</i>	<i>h.m.</i>	
Blanchard Springs		2.80	21-22			
Do		2.60	13-14			
Camden		3.30	18-19			
Elon	10.85					
Fulton		2.61	19			
Helena		2.73	14-15			
Lonoke		4.75	21-22			
Do	12.00	3.00	11			
Luna Landing		2.75	14			
Magnolia		2.95	19			
Marvell		2.55	18			
Do	12.18	2.75	14			
Do		2.88	19			
Monticello		3.00	22			
Moore		2.52	13-14			
Do		2.70	14			
New Gascony		3.00	22			
Osceola	12.67	2.50	18-19			
Do	12.38	2.68	11			
Do		2.90	14-15			
Pinebluff		3.09	19-20			
Do	14.50	3.60	11			
Do		3.05	14			
Do		3.01	19			
Prescott	10.20					
Rison	11.30					
Stuttgart	13.10	3.01	19			
Warren	10.97					
Wiggs		2.56	11			
<i>Indiana.</i>						
Evansville		2.54	19-20			
Madison		2.90	20-21			
Marengo		2.65	19-20			
Rockport		2.71	19			
Vevay	11.60	3.50	9-10			
Do		2.60	19-20			
<i>Kentucky.</i>						
Alpha	10.60					
Bardstown		2.65	15			
Do		2.73	22-23			
Blandville		2.73	19			
Bowling Green		3.02	14-15			
Edmonton	11.99	3.02	14-15			
Ensor	10.53	3.35	22			
Falmouth		2.60	19-20			
Fords Ferry	10.30	3.30	8-9			
Henderson		2.80	19			
Hopkinsville		3.05	19			
Leitchfield	11.73	3.12	22			
Lexington	10.73	3.01	22			
Louisville		2.76	22			
Mount Hermon		2.55	22			
Owensboro		3.00	22			
Do		2.67	19-20			
Owenton	11.70	2.96	9-10			
Do		2.78	21-22			
Paducah		3.00	19-20			
Pleasure Ridge Park		2.79	22			
Richmond		2.60	22			
Russellville		2.70	22			
St. John		2.65	22			
Shelby City		2.80	22			
Shelbyville		2.50	22			
<i>Louisiana.</i>						
Abbeville		4.65	18			
Alexandria		3.21	18-19			
Bastrop		3.61	18-19			
Cheneyville		3.70	19			
Clinton	10.32	4.69	18-19			
Farmerville		3.60	18-19			
Franklin		2.67	19			
Grand Coteau		4.25	18-19			
Jeanerette		4.08	18-19			
Jennings		4.99	18-19			
Lake Charles		4.50	18-19			
Melville		4.60	18-19			
Monroe		3.93	18-19			
New Iberia		5.50	18-19			
Oakridge	12.25	4.70	18-19			
Rayne		6.14	18-19			
Shellbeach		3.40	18-19			
<i>Massachusetts.</i>						
Framlingham		2.65	31			

TABLE XI.—Excessive precipitation—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Massachusetts—Continued.</i>		<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>h. m.</i>	
South Clinton.....		2.94	*			
Sterling.....		2.54	*			
<i>Michigan.</i>						
Omer.....		2.50	23			
<i>Mississippi.</i>						
Austin.....	13.58	3.92	19			
Edwards.....		3.38	19			
Fayette.....		2.50	15			
Do.....		2.60	18-19			
Greenville.....		2.91	19-20			
Greenwood.....	11.39	5.03	18-19			
Holly Springs.....	11.22	3.60	19-20			
Natchez.....		2.75	15			
Okolona.....		3.23	18-19			
Port Gibson.....		3.57	18-19			
University.....		3.25	19			
Do.....		3.10	22			
Water Valley.....	10.12	2.74	19	2.00	1 40	19
<i>Missouri.</i>						
Liberty.....		3.35	12			
<i>New York.</i>						
Keene Valley.....		3.00	20			
<i>Ohio.</i>						
Cedarville.....		3.05	22			
Cherryfork.....	11.69					
Portsmouth.....	10.03	2.62	9-10			
<i>Oregon.</i>						
Bay City.....	14.26					
Cascade Locks.....	10.63					
Glenora.....	11.71					
Government Camp.....	11.46					
Nehalem.....	11.52					
<i>Tennessee.</i>						
Ashwood.....		2.57	11-12			
Bolivar.....	12.01	3.70	22			
Carthage.....		3.46	10-11			
Clarksville.....	10.41	3.00	22			
Covington.....	11.72	4.00	11-12			
Do.....		3.00	22			
Dover.....	11.16	2.55	14-15			
Do.....		3.00	22			
Dyersburg.....	13.93	2.54	11			
Do.....		3.55	19-20			
Do.....		2.80	22			
Hohenwald.....	10.35	3.39	14-15			
Jackson.....	11.10	2.70	19-20			
Do.....		2.80	21-22			
Knoxville.....		2.61	11			
Lafayette.....	11.11					
Liberty.....		2.72	11-12			
McKenzie.....	14.47	2.50	19			
Do.....		3.62	22			
McMinnville.....	10.65	3.35	11-12			
Mayville.....		3.10	11-12			
Memphis.....	10.72	2.60	18-19			
Do.....		2.65	22			
Nashville.....		3.33	10-11			
New Market.....		2.60	11			
Palmetto.....		2.62	11-12			
Perryar.....	12.75	4.15	19-20			
Do.....		2.90	22			
Pope.....	11.02	2.92	11-12			
Do.....		2.67	14-15			
Rugby.....	10.87	2.63	19-20			
St. Joseph.....	10.85	2.83	14-15			
Sylvia.....	12.33	2.97	10-11			
Do.....		2.85	22			
Trenton.....	14.86	2.96	14-15			
Do.....		3.67	18-19			
Do.....		3.36	21-22			
Union City.....	12.07	3.20	19-20			
Wildersville.....	12.55	2.91	14-15			
Do.....		2.60	19-20			
Do.....		2.93	22			
<i>Texas.</i>						
Colmesneil.....		4.57	18			
Galveston.....		2.64	17-18	1.38	1 17	18
Jasper.....		2.80	13			
Longview.....		3.60	17-18			
<i>Washington.</i>						
Clearwater.....	15.62					

*January 31 to February 1.

Chart I. Tracks of Centers of High Areas. January, 1898.

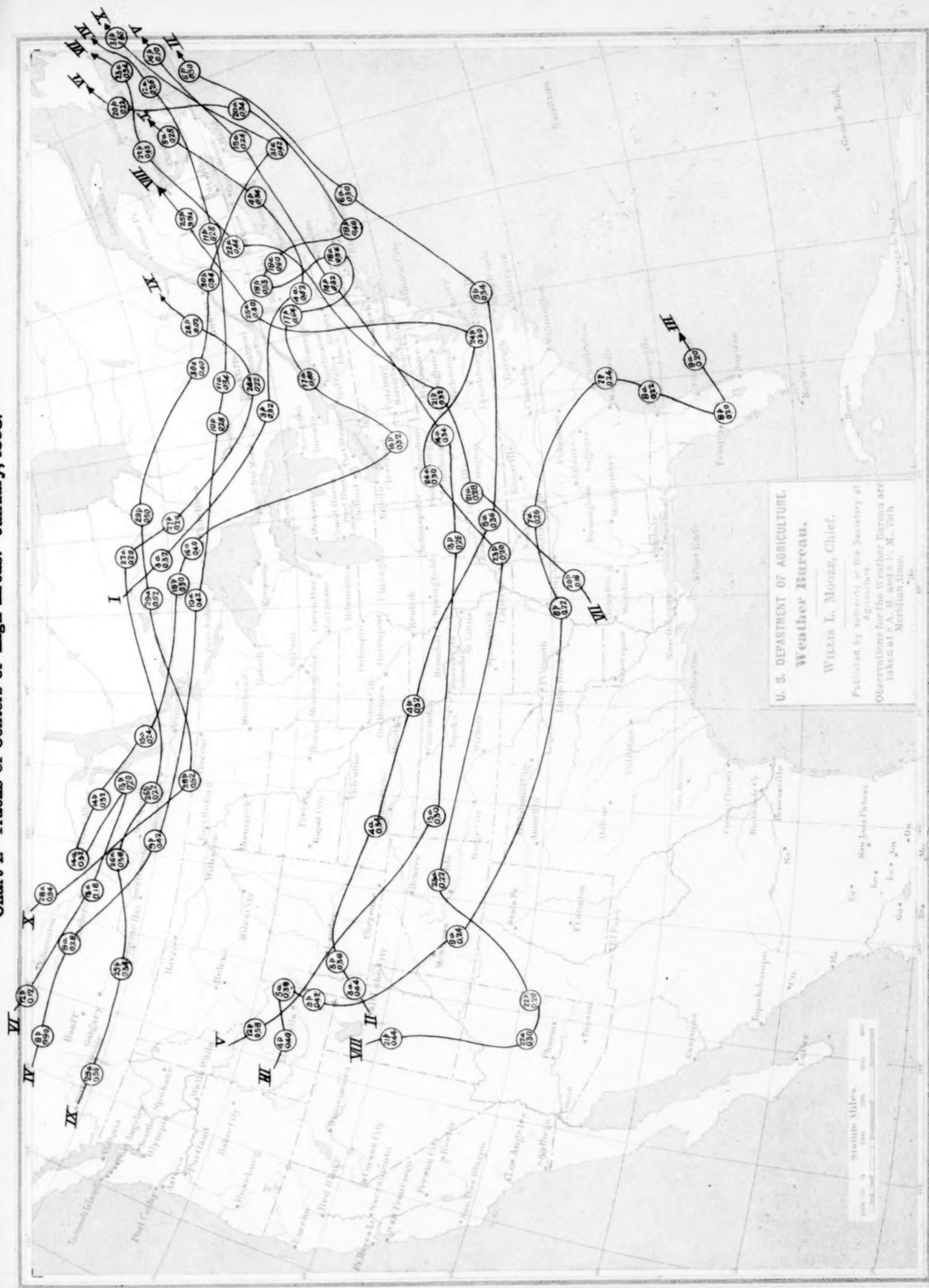


Chart II. Tracks of Centers of Low Areas. January, 1898.

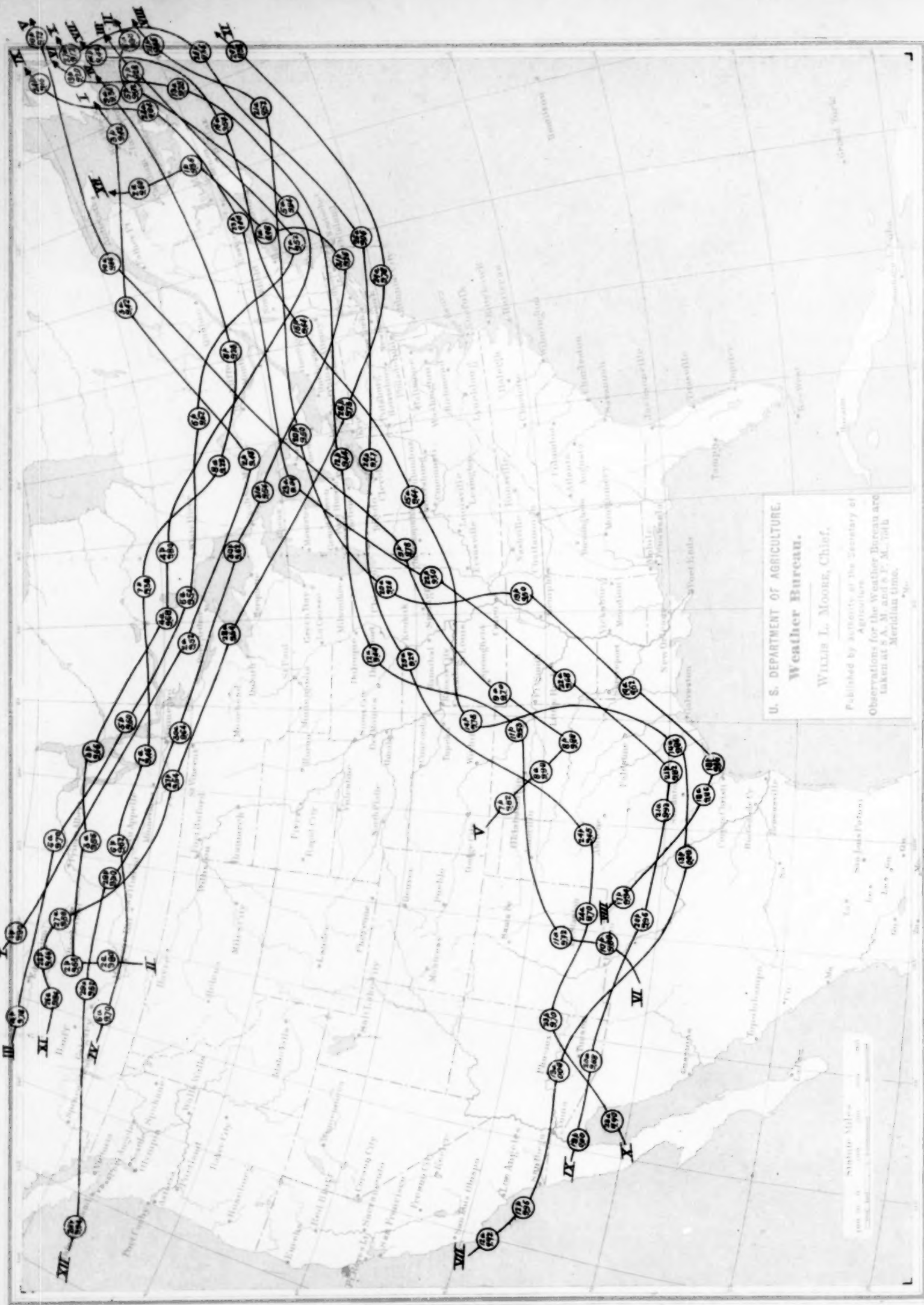


Chart III. Total Precipitation. January, 1898.

Chart III. Total Precipitation. January, 1898.

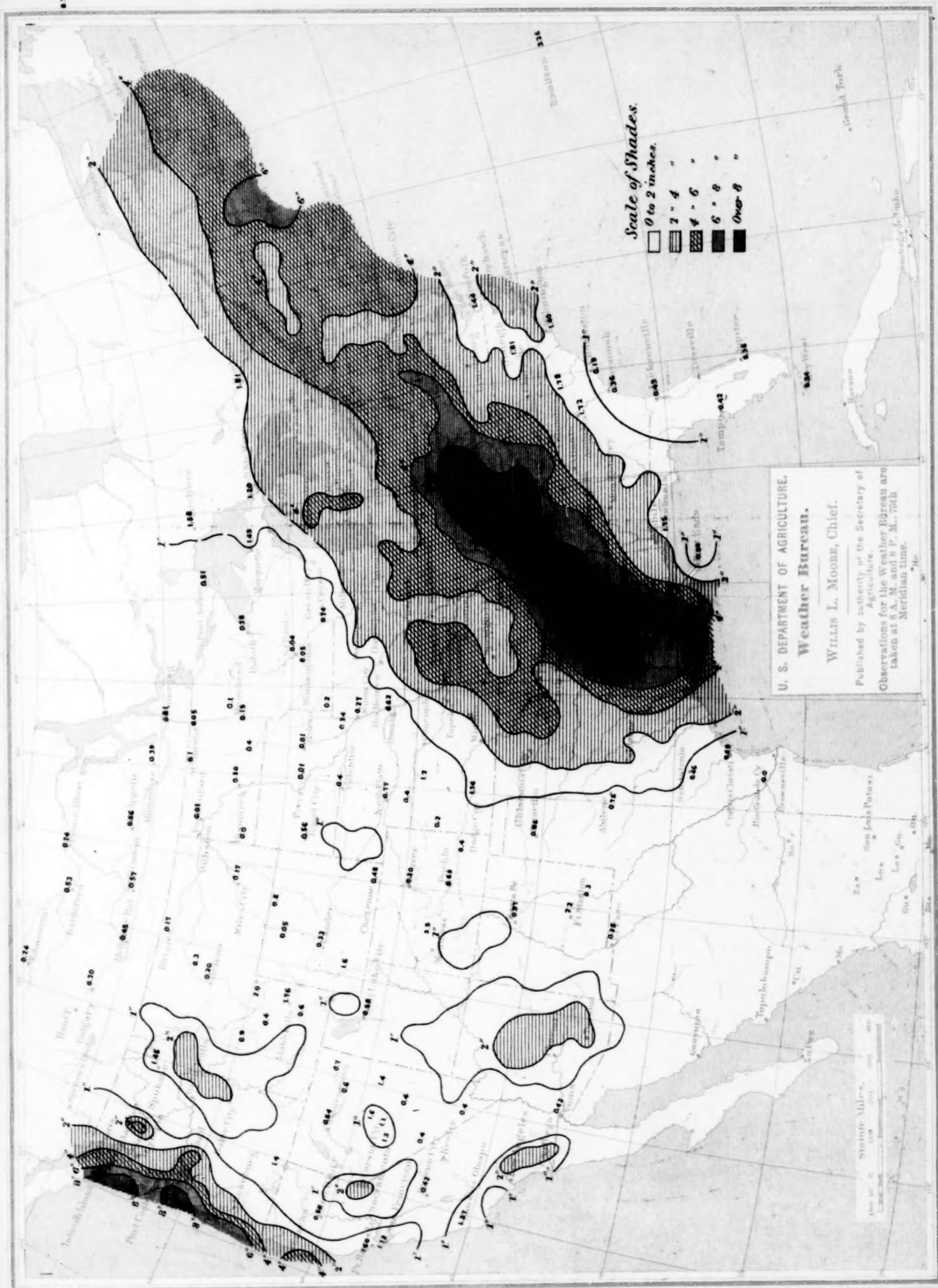
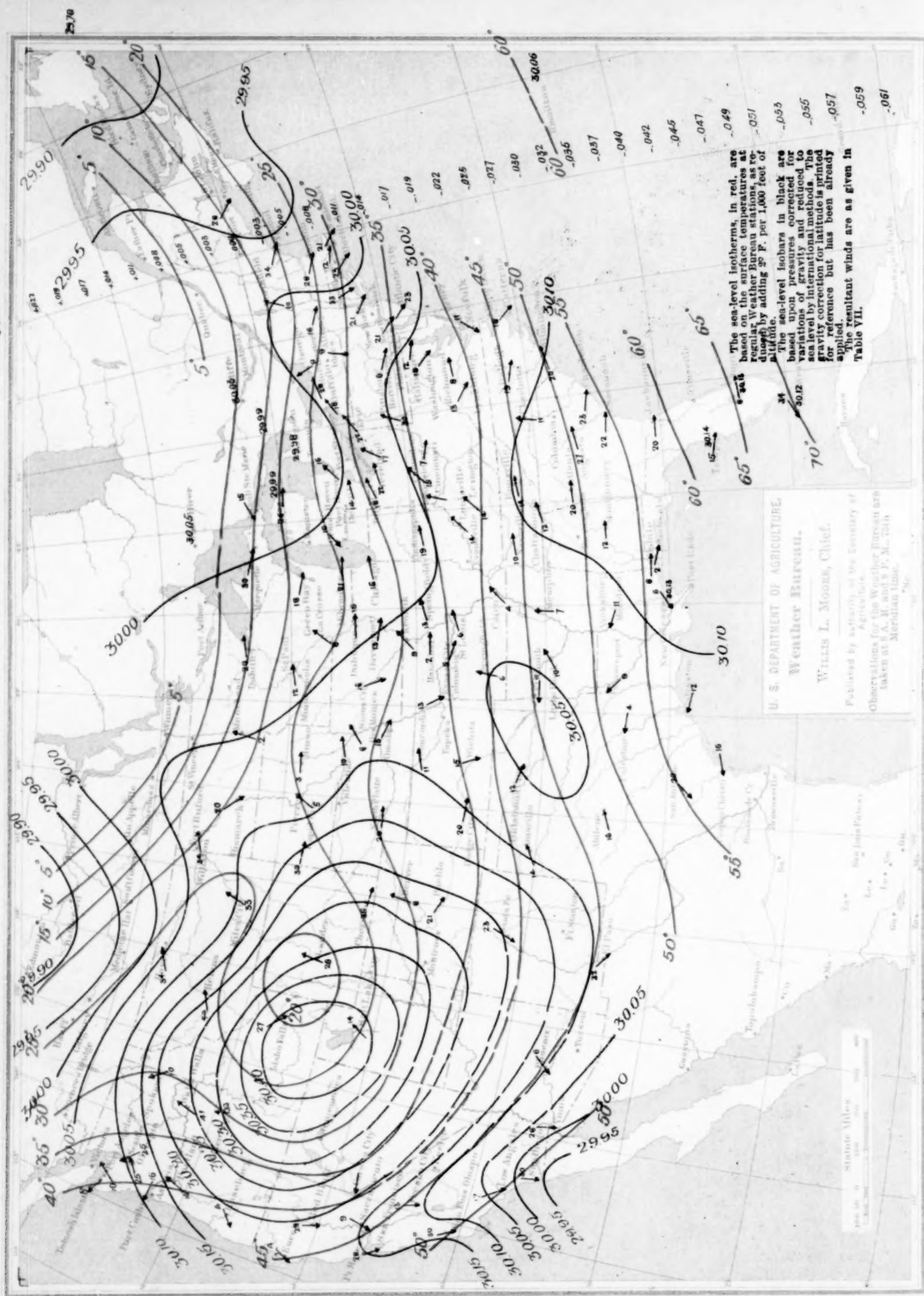


Chart IV. Sea-Level Pressure and Temperature and Resultant Surface Winds. January, 1898.



The sea-level isotherms, in red, are based on the surface temperatures at regular Weather Bureau stations, as reduced by adding 5° F. per 1,000 feet of altitude.

The sea-level isobars in black are based upon pressures corrected for variations of gravity and reduced to sea level by international methods. The gravity correction for latitude is printed for reference but has been already applied.

The resultant winds are as given in Table VII.

U. S. DEPARTMENT OF AGRICULTURE,
Weather Bureau.
Willis L. Moore, Chief.

Published by authority of the Secretary of Agriculture.
Observations for the Weather Bureau are taken at 8 A. M. and 5 P. M., 1918.
Meridian time.

Chart V. Hydrographs for Seven Principal Rivers of the United States. January, 1898.

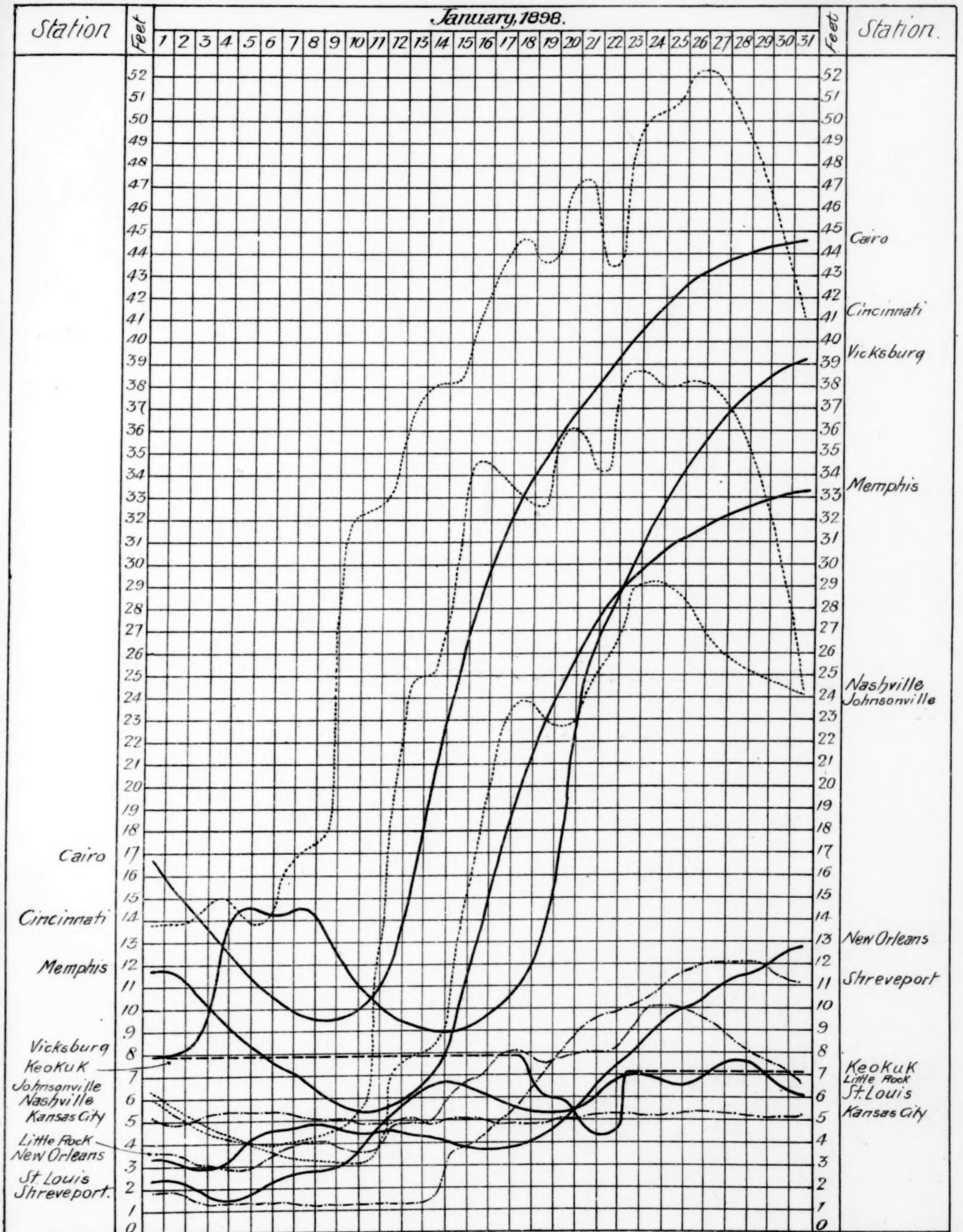
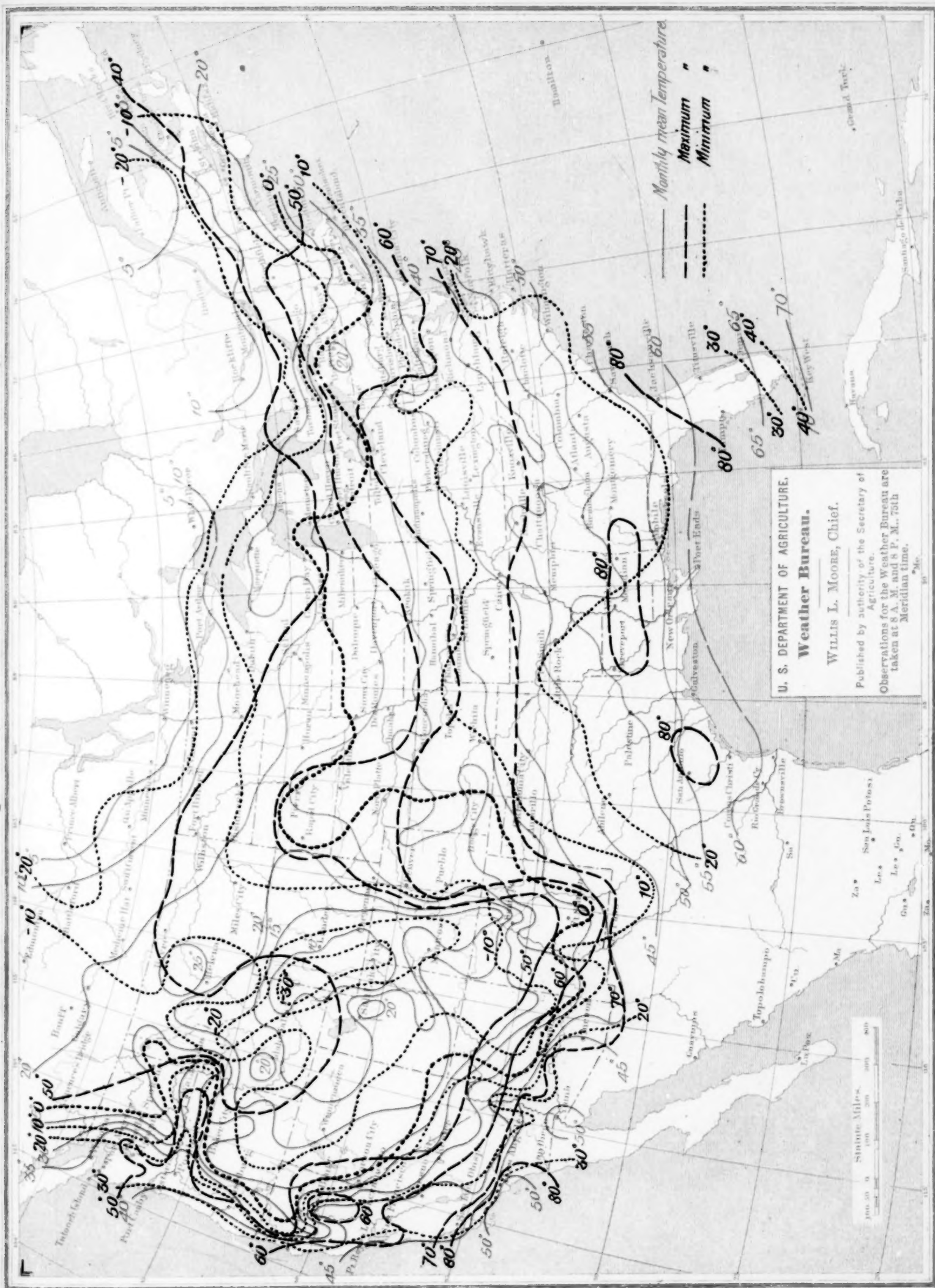


Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. January, 1898.



U. S. DEPARTMENT OF AGRICULTURE,
Weather Bureau.

WILLIS L. MOORE, Chief.

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Agriculture.
Observations for the Weather Bureau are
taken at 8 A. M. and 8 P. M., 75th
Meridian time.

Chart VII. Percentage of Sunshine. January, 1898.



Chart VIII. Total Snowfall. January, 1898.

Chart VIII. Total Snowfall. January, 1898.

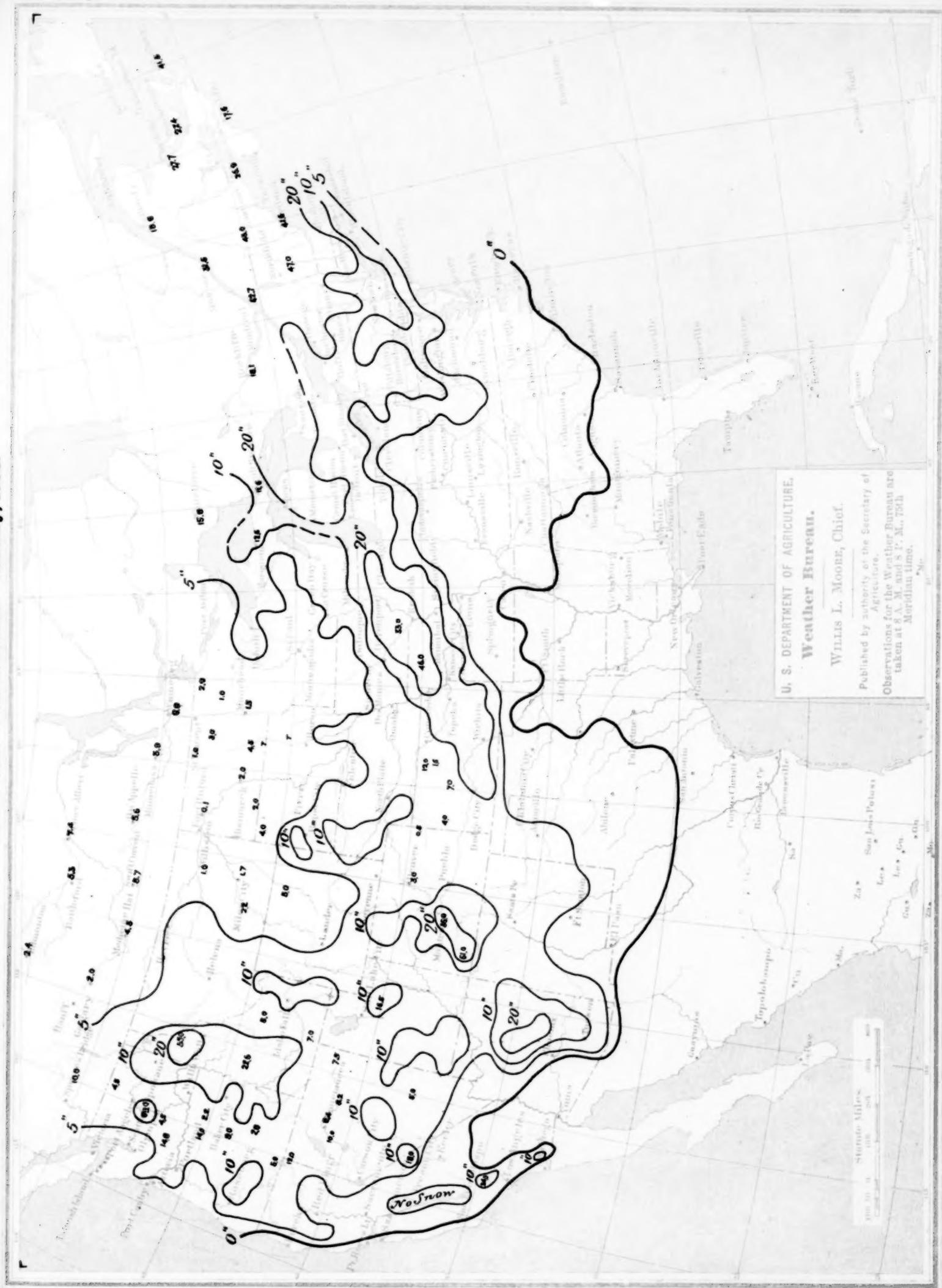


Chart IX. Depth of Snow on Ground at the Close of the Month. January, 1898.



Chart X. January 31, 1898, a. m.

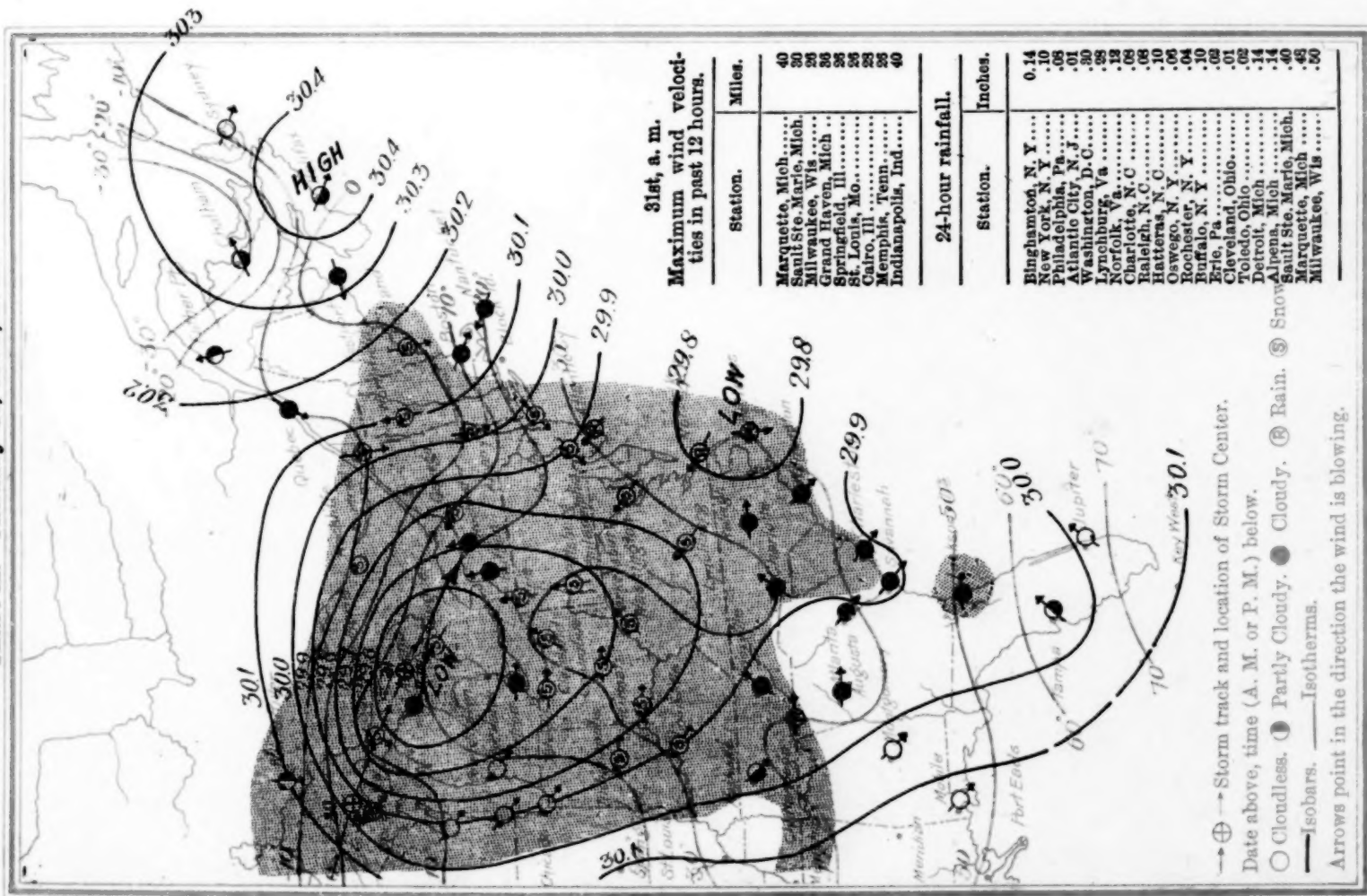


Chart XI. January 31, 1898, p. m.

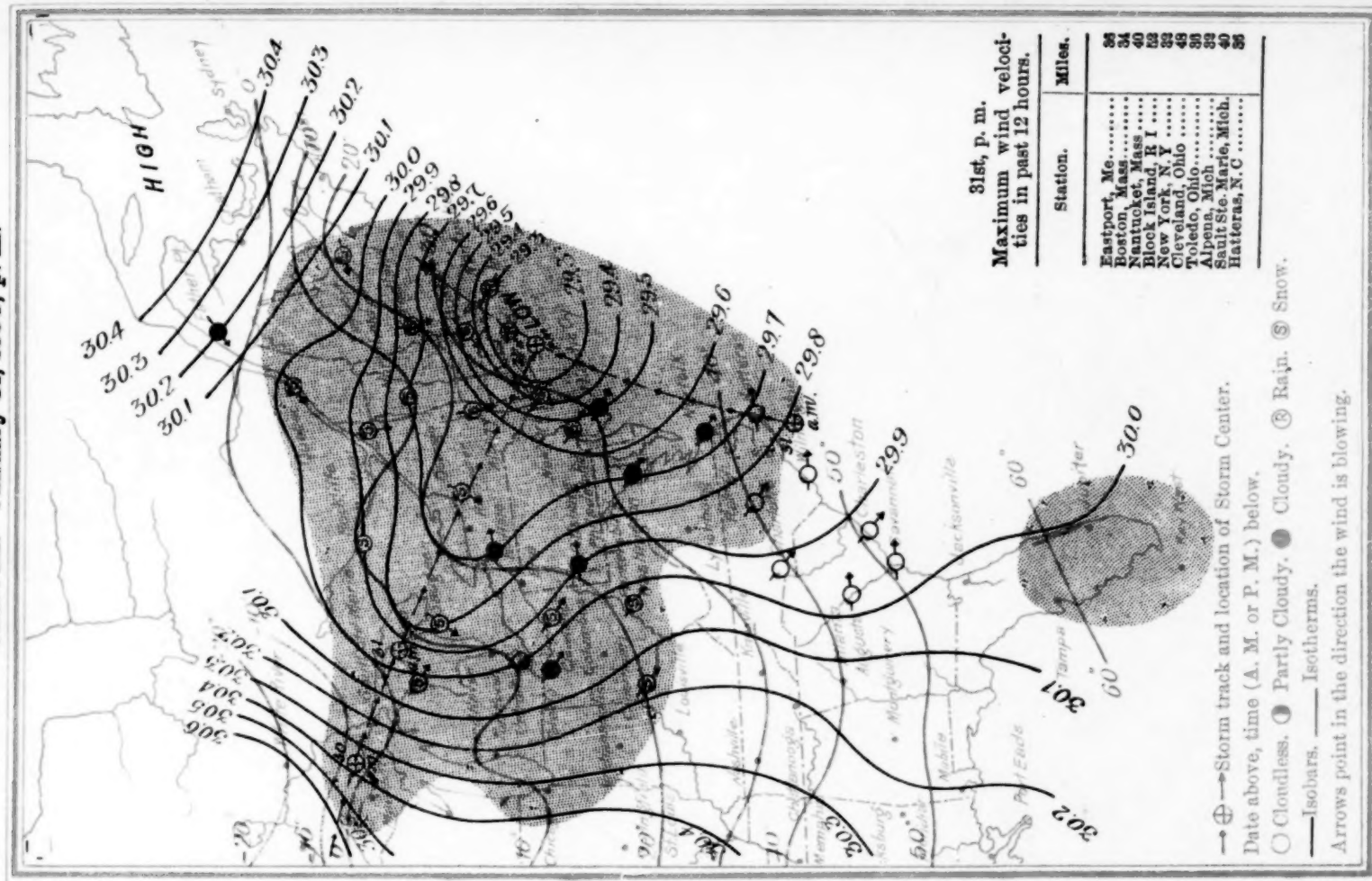


Chart XII. February 1, 1898, a. m.

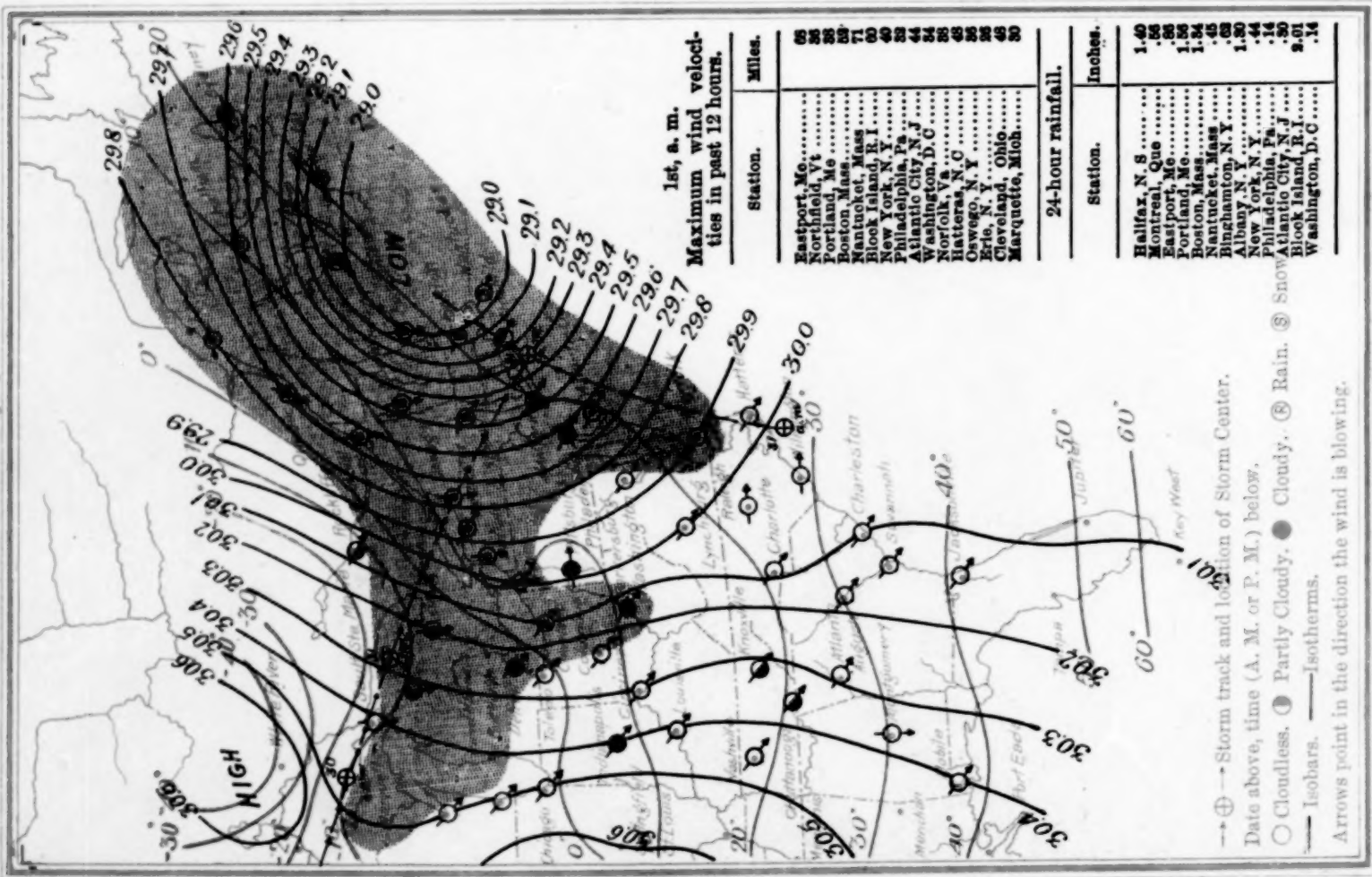


Chart XIII. February 1, 1898, p. m.

